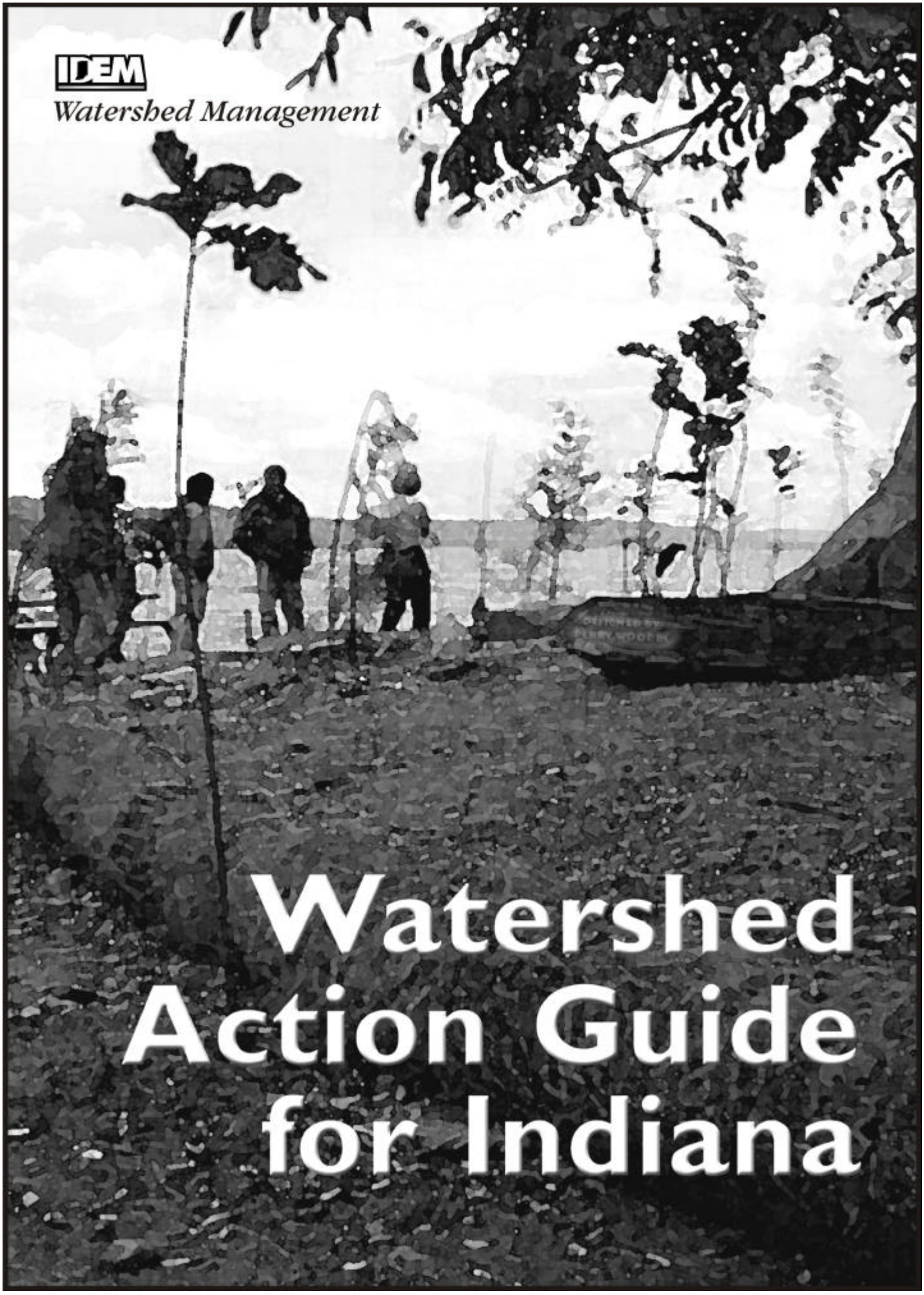
IDEM
Watershed Management
Watershed
Action Guide
for Indiana

Watershed Action Guide
for Indiana

Straight Talk on Developing Watershed Plans

Revised May 1999

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Contents

Introduction

Why was this Guide produced?

- To fill a need for technical information and practical instruction on developing watershed management plans
- To promote working within the watershed framework that has been established for conservation and planning activities in Indiana
- To provide details of the technical aspects of plan development
- To share information with local groups and agencies that are doing watershed work

What does this Guide contain?

- Processes that have enabled watershed groups to succeed
- Steps to developing a watershed management plan
- Resources:
  - Publications and websites
  - Contacts within agencies and organizations
  - Water quality data sources
  - Funding sources
  - Guidance for developing watershed partnerships

Stuff we really want you to pay attention to . . .

1. **The steps in forming a partnership and developing a watershed plan may take place at different times than the way they are presented in this book.** Some things will happen at the same time, and you may repeat some steps. This is okay. It's also why it is not possible to write a cookie-cutter prescription for watershed activities, and we didn't try.

2. **This book will do you absolutely no good if you don't open it and read it.** The lists of sources and references are starting points — we expect you to add more. Successful groups do their homework.

3. **Think small.** The smaller the watershed, the better the group can relate to it and the faster it will react to changes in management practices. If you are dealing with a big watershed, pull out one piece to work on as a pilot project.

4. **Leaving people out creates time bombs.** Bring all interests to the table in the beginning, and if you discover that some are not represented, bring them in as soon as you can.

5. **There are leaders in every community.** They're made, not born. Good leaders help reach consensus, encourage new ideas, promote open communication, listen patiently and with open minds, and make sure everybody has a chance to talk. They also make sure there's coffee.

6. **Teach each other.** No idea is too simple to be taught, and everyone is an expert at something. Farmers can teach homeowners about fertilizer. Bankers can help the group develop a budget.

7. **Always ask why.** "Why" can uncover the concern behind an opponent's position, the cause of an environmental problem, or the reason for poor attendance at meetings. If you don't ask, you won't find out.

8. **Broadcast successes.** Tell each other, the community, your sponsors, everybody. You deserve the attention.

9. **Don't ask "Do you like it?" Instead, ask "Can you live with it?"** Consensus does not have to mean total agreement, but total support.

10. **Conflict = energy.** Properly harnessed, conflict can spur new ideas, bring new people into the partnership, and wake up the group.

11. **Bite your tongue.** Be patient. The watershed didn't get where it is yesterday, and you won't fix it tomorrow. Be nice to each other. You may need that guy on your side in a discussion next month, and if he's committed enough to be at every meeting, he deserves your respectful attention.

Chapter One

Building the Group

FOCUS

- Why form a watershed partnership?
- What makes a group successful?
- What are the obstacles to success?
- The People Resource: Getting people to participate
- Forming an education committee
- Keeping the community in the loop

"We're smarter together than we are by ourselves."

~ Dennis Phillippi ~

Why form a watershed partnership?

- Members have identified a need or problem that they cannot address alone;
- Members individually lack adequate funding, skills, jurisdiction, et cetera, and by pooling resources can tackle the problem more effectively;
- A project has been identified that will benefit several groups or individuals;
- There is an opportunity to enhance natural resource management by drawing expertise and information from a wide range of individuals who live in and know the resource base and the local community;
- Partnership in a diverse group enables the development of creative solutions;
- Plans are more acceptable to the community and easier to maintain in the long term when many interests are involved.

Note: *Your group may think of itself as a* ***team, alliance, partnership, or watershed group****. The name is up to you. We will use "group" most of the time, simply because it's short.*

What makes a group successful?

- **Broad representation:** all interests in the watershed are represented.
- **Local knowledge:** a wide range of people who live and work in the watershed and know how things function on the local level.
- **Effective communication:** communication is the primary tool used to resolve conflict and reach agreement. Conflict is reduced because everyone understands the issues and each other's needs and concerns.

- **Common vision:** a shared community vision builds long-term support. With the public fully involved in planning and decision making, personal responsibility and commitment are increased.
- **Collaborative decision making:** decisions usually are made by consensus and everyone's needs are heard. By working to address all concerns, groups often develop creative solutions that are widely accepted.
- **Pooled resources:** management is improved by meshing the resources of several agencies and organizations.

What are the common obstacles to success?

- **History of unresolved conflict** among key members and an unwillingness to work at resolving the conflict.
- **Lack of clear purpose.**
- **Problems are not clearly defined** or are not felt to be critical.
- **Unrealistic goals or time frames.**
- **Key interests or decision makers are not included** or refuse to participate.
- **Partnership is not equitable:** some interests have disproportionate amounts of power, or not all partners stand to benefit, or members are not receiving credit for their contributions.
- **Lack of commitment:** financial and time requirements outweigh potential benefits, or some members are not comfortable with the level of commitment required.
- **Lack of follow-through** with action plans.
- **Basic values conflict** with no room for negotiation.

The people resource

Having everyone at the table

Failure to involve important interest groups or segments of the population is a common source of problems in watershed groups. Stakeholders who don't participate—or, worse, have not been invited—can undermine the group's efforts.

Full and balanced representation of all interests in the watershed promotes trust. This means that all interests are represented, but no single interest dominates the group. Working through the conflicting interests of different stakeholders makes the group stronger.

Bringing everyone to the table and keeping them there can be the greatest challenge facing a fledgling group. It can be tough to pull together a group with disparate interests, especially when the issue in the watershed is not visibly critical or is poorly understood. The personal time and effort invested in this stage of partnership building pays great dividends later on, however. Planning and implementation become easier because the group is well integrated, and all the resources of the community can be harnessed to meet the group's goals. ***It cannot be stressed too often that the best way to bring people into your project is to sit down with them and talk, face-to-face, about what the group hopes to accomplish.***

Leadership should emerge from within the group. Leadership roles should be filled by people from the local community. It is rarely appropriate for an agency employee to have a prominent leadership role in the group once the partnership is fully developed.

Use a facilitator

It may be helpful to consider using a trained facilitator for meetings. A good facilitator can bring out the best in a group, help meetings stay on track, channel conflict into useful energy, assist in developing effective ways to work together, and generally ease the process of partnership formation and decision making. Facilitators are availble through consulting firms. Trained facilitators are also available from several federal and state agencies.

When inviting stakeholders to join the partnership, ask:

- Who could be affected by the group's decisions?
- Who could provide technical assistance, develop communication pathways, act as liaison to local political bodies?
- Who stands to benefit if the problems in the watershed are addressed, or suffer if problems are not addressed?

During the course of the project, ask:

- Should new groups or individuals be brought into the partnership?
- Are there enough interests represented to make good decisions that the community will support?
- Are the best people included to fill roles that have been identified?

Encourage participation:

- Appeal to people's sense of stewardship.
- Show how the problems in the watershed affect people.
- Stress that participation is voluntary.
- Let prospective members know what will be expected of them and how much time they will be expected to commit.

Find ways to recognize the group and its members publicly, so the community knows who is representing them:

- Encourage peer networking; have members personally recruit others.
- Conduct site visits and tours to generate interest.
- Use all available media to give the project a presence in the community.
- Establish a clear sense of direction, so people know what to expect.

Prevent burnout:

- Start with small projects that will provide early successes.
- Document and celebrate progress.
- Use rewards and incentives for continued participation.
- Do hands-on projects to give members a sense of ownership.
- Maintain a stable structure, with accountability to members.
- Identify specific benefits to landowners and participants.
- Keep track of accomplishments. Make sure the community knows about them.
- Develop personal relationships in the partnership so you may avoid conflicts and obstacles.
- Provide food, and have some fun!

Outreach, outreach, then outreach again!

Form an education committee

Establish an education committee. The focus of the committee should be to raise awareness among land users about soil and water resource problems and their control, and to build local support for an active watershed education program.

Identify education priorities. Priorities established by the education committee should reflect the resource concerns enumerated in the group's watershed management plan. It is vital that the education committee stay in close communication with the other committees within the group.

Identify the target audience. Determine who should receive the education that can help the watershed group accomplish its goals. Typical audiences would include agricultural and nonagricultural landowners, local politicians, county officials, elementary and secondary students, urban land developers, et cetera.

Characterize each audience. Key characteristics of an audience to consider include its values, motivations, natural resource interests, attitude toward the watershed project, information gathering habits, and work habits.

Establish measurable objectives. Objectives probably will vary among audiences, but if measurable, will allow the education committee to evaluate progress.

Design effective education activities. Design specific activities to achieve objectives, such as tours, exhibits, videos, direct-mail campaigns, workshops, placing curriculum material with teachers, etc. Check the appendix for additional resources and ideas.

Determine constraints to success. Knowing the limitations or barriers that prevent a program from being successful in the beginning can help prevent setbacks or unexpected failures.

Implement the education plan and evaluate progress. Periodically evaluating progress allows the education committee to adjust or redefine priorities and objectives.

Keep the community in the loop

Develop a publicity plan during, or right after, your initial public meetings. Determine the audience, the message, how the message will be delivered, who will do the work, when it will be done, and how you will evaluate the effectiveness of your publicity plan.

Suggested activities:

- **Posters:** For store windows, libraries, grain elevators, farm suppliers, grocery stores, post offices, etc.
- **Newspapers:** Write a feature article or series of articles for local newspapers. Find out who the feature editor is and develop a relationship with him or her. Use photographs of meetings and watershed events.
- **Television & radio:** Local stations have community interest shows and may announce local events. Ask to have someone from the watershed group interviewed. If there is a college in the community, video and other services may be available.
- **Exhibits:** Set up displays in libraries, SWCD offices, co-ops, county fairs, and anyplace that seems appropriate to publicize your accomplishments. Have handouts available.

- **Newsletters:** Report watershed activities in local newsletters that reach your target audience. Share success stories in Conservation Partnership newsletters such as Nonpoint Notes, Topsoil, Partnership Today, and in others such as Farm Bureau, Extension Service, Hoosier Chapter Soil & Water Conservation Society, Farm Service Agency, RC&D, utility companies, and organizations involved in your project.
- **Presentations:** Contact local leaders and ask to be on the agenda of civic group meetings, including Rotary, Jaycees, Optimists, Lions, as well as the County Commissioner's and Plan Commission meetings. Also contact interest groups such as Corn Growers, Soybean Growers, Cattlemen, Farm Bureau, Forestry and Woodlot Owners, Pork Producers, Young Farmers, FFA, Conservation Clubs, 4-H Boards, Extension Boards, SWCD Boards, etc.
- **Direct Mail:** Mail minutes, reports, critical issues, et cetera to *everyone* who attended or was specifically invited to attend watershed project meetings and public meetings. Mail letters reporting accomplishments to all principle stakeholders and interest groups. Investigate obtaining a bulk mailing license (there are annual fees) or partnering with a licensed organization to reduce costs. The post office has a free manual explaining the requirements and procedures for bulk mail.
- **Signs:** Use signs to advertise watershed activities. Place signs at project sites and on major roads to alert drivers that they are entering or leaving the watershed.
- **Personal contacts:** There is no substitute for one-on-one contact, in person or by phone, to explain your group's goals and plans, answer questions, and ask for support and participation.

Outreach is crucial at the beginning of the watershed planning effort, during the planning process, and after the plan is completed. It you are to have an effective watershed plan, you must constantly communicate with others what you're working to achieve.

How can outreach help ensure the success of your goals? Outreach and education can aid in developing an understanding of the value of our water resources, educating people on what's threatening the resources, and encouraging protective action. Outreach is key to building an awareness of the process and issues, educating stakeholders concerning necessary actions, and motivating individuals to implement those actions.

Outreach is so important that it cannot be fully addressed in this guide. The best booklet regarding outreach approaches is published by The Council of State Governments and is called ***Getting in Step: A Guide to Effective Outreach in Your Watershed***. The publication effectively addresses how best to define your goals, identify your audience, create, package and distribute your message, and evaluate your plan.

To order a copy, contact:
Books on Demand
1-800-521-3042
or go to:
www.statesnews.org/gettinginstep.htm

Chapter Two

Setting Goals

FOCUS

- Identify the community's concerns
- Develop a problem statement
- Develop a vision statement
- Develop a mission statement
- Set measurable goals
- Achieve consensus

The process of expressing concerns, developing a practical, clear vision, and setting measurable goals can be long and exhausting. However, experience shows that no group can be successful unless it plows its way through this process. Much confusion arises from a limited understanding of the terms and jargon that accompany the process. All of the material written on this topic revolves around trying to help the group answer a fairly simple question: ***What problems do we have in our watershed, and what do we want to change?***

Identify the community's concerns

When people are stirred up enough to attend public meetings or commit to being regular members of a group, it is usually because they feel something is wrong and want to fix it. They also may be there because they want to prevent their own oxen from being gored. They may be curious, apprehensive, angry, or determined. What is universal is that everyone has an opinion!

In the early stages of forming a watershed group, it is important to get all of these opinions out in the open and onto paper. It is also important that the opinions not be judged at this stage. Every worry, concern, reservation, and passionate conviction of the group should be aired in an unconfined, non-threatening forum. ***Stress that individuals should state needs or interests, not positions (what they are for or against).***

Examples: Position..... I refuse to put up a fence!
Need..... My cows need access to pastures on both sides of the creek.

Resolve opposing positions by asking why stakeholders have taken certain positions. Keep asking why again and again. It often takes many layers of "whys" to uncover an interest common to other stakeholders.

Once all concerns about natural resource, economic, and social issues in the watershed have been expressed, the group may go through several exercises to focus on those

that are most important to them. If the watershed is large or falls naturally into several different areas, enough meetings should be held to make sure everyone has had a turn to speak. At each meeting all concerns should be recorded without censoring, and a record of all concerns should be retained.

Develop a problem statement

Before a group can develop visions and goals, it needs a clear, widely accepted problem statement or series of statements. This helps establish a common understanding of the conditions that warrant a watershed protection effort. Note that "problem" does not actually mean there is something wrong with the water. It may be recognition of a threat to water that is still clean.

While the group is acknowledging concerns that have been expressed and trying to focus on the ones that will be most important to them, members should try to state the cause of the concerns.

Example: Concerns..... "The fishing's no good any more."
"The water looks brown all the time."
"I'm afraid to let my kids swim in the creek."

Problem statement..... "Crawdad Creek does not support swimming and fishing uses."

A problem statement should put the concerns into practical, objective, unemotional terms.

Develop a vision statement

A group without a vision is similar to a family on vacation without a road map. Members may see some neat things and enjoy themselves but never get where they planned to go – and the opportunities for conflict are certainly more numerous!

A vision is a statement about what the future will look like. It need not be long, fancy, or carved in stone.

Example: Vision ....."Crawdad Creek is safe to swim in, supports a healthy fish population, and looks attractive."

A vision statement should

- Evoke clear and positive mental images of "What it should be like around here."
- Give meaning to the work expected from people.
- Create pride, energy, and a sense of accomplishment.
- Link the project with results.

A vision statement can be

- Simple.
- Engaging to the heart and spirit.
- An assertion of what you want to create.
- A living statement that can change and expand.
- A starting place.

The attempt to craft a vision can be one of the hardest parts of group formation, since it reaches to the heart of what people believe and why they are there. Hours have been spent debating the merits of one word against another, which is why one source says a vision should be "closer to five words than to fifty." But when heads begin to nod and people mutter, "Yes! That's it!" the group will know it is getting close.

When they have a draft vision statement up on the flipchart, group members should ask these questions:

- Can it be accomplished? Is it doable?
- Have all group members been honest with themselves and others? Is this vision authentic?
- Is it worth getting excited about?
- If achieved, will it make this a better place? Do people have something to gain from it?

Every member of the group should be able to remember the vision and should be able to support it. It is worth the time spent to get to this point. It sets the foundation for the rest of the group's work.

Develop a mission statement

While a vision statement expresses "What it should look like around here," a mission statement expresses "Why this group exists." If the vision statement is a good one, writing the mission statement should not take long. Some groups bypass this altogether if their vision and focus are clear. However, it's worth the time to clarify why this particular group has come together at this time to accomplish this particular work. Or, put another way, "What's the business of this group?"

To formulate the mission statement, ask

- Who are we?
- Whom do we serve?
- What do we offer?
- How do we serve?

Always keep in mind that the value of a vision and a mission is not in the statements on the wall. It's in the group members commitment to achieve them.

Example: Mission .....The Crawdad Creek Community is a partnership of concerned citizens dedicated to developing and implementing a successful watershed plan to protect and maintain water resources in the Crawdad Creek Watershed.

To test the draft statement, ask these questions:

- Does it answer the four previous questions?
- Is it clear and understandable to all stakeholders?
- Is it brief and memorable?
- Is it unique to this group?
- Does it reflect the group's core values?
- Is it broad enough to be flexible without being fuzzy?
- Will it help the group make decisions?

Set measurable goals

Having defined a problem, a vision and a mission statement, the group is ready to get to work. To achieve its vision there must be a ***clear and measurable set of goals***. Effective goals encourage decision-making, motivate people, focus the energy and resources of the group, and make it possible to measure progress.

There is usually some confusion about the differences among goals, objectives, and tasks. It is recommended that the group concentrate on identifying goals and tasks.

Definitions may be useful:

A **goal** is the purpose toward which effort is directed.

Examples: Reduce sediment delivery by 10% in three years.
Restore small mouth bass population to fishable levels by 2010.
Establish riparian vegetation on 30% of stream banks in five years.

A **task** is an activity assigned, aimed at reaching a goal.

Examples: Joe will write a newspaper column each month.
The group will convene a technical advisory committee in March.
Marie will contact all the landowners in these two townships by the next meeting.

Goals agreed upon by the group should be ***reachable, measurable, and clear***. Goals also must be ***flexible***, since information gathered later in the planning process may cause the group to add or modify goals.

Achieve consensus

Consensus is a collective opinion arrived at by a group of people working together under conditions that permit open communication and a supportive climate, so everyone in the group feels they have had a fair chance to influence the decision. ***When a decision is made by consensus, all members understand the decision and are prepared to support it.***

In real groups, consensus means everybody in the group can rephrase the decision to show they understand it. Everyone has had a chance to say how he or she feels about the decision. Members who still disagree or have doubts are willing to publicly commit to the decision and agree not to sabotage it.

- The advantages of working toward consensus are that people are more likely to be committed to the decision, it provides win-win solutions, it provides better communication by requiring members to listen and understand each other, and it provides an opportunity to resolve conflict.
- The downside is that consensus takes more time, and to be successful, every member must participate and be willing to be open. It also requires the use of an unbiased, trusted facilitator, at least in the early stages of group formation.

History shows long-term projects are more likely to be successful and maintain participation if they operate by consensus. It is worth going slow now so you can go fast later. The group learns how to harness the energy of conflict and be open and trust one another. They are more able to deal with barriers and challenges in the future and are more committed to success.

Explore your library and the internet for more information on consensus and negotiation. Also, consider requesting NRCS assistance to hold a **Coordinated Resource Management Workshop**. When the group has come together but is not entirely sure how to proceed, a workshop or the use of an outside facilitator can help it move forward.

Chapter Three

Conducting a Watershed Inventory

FOCUS

- Determining theinformation you need
- Organizing an inventory team
- Collecting the data
- Resources for finding the information you need

Inventory—the collection of natural resource, economic, and social information within the watershed.

After your group has worked through writing vision and mission statements and has established goals for change, it is important to answer the question **"What is our watershed like right now?"** Conducting an inventory consists of gathering and organizing all the relevant information on the watershed in order to answer that question.

A watershed inventory should provide the data for your group to make informed resource management decisions. Information must be gathered in order to understand the watershed's present condition, the potential of the natural resources in the watershed, and the human interaction with those resources. An inventory provides benchmark conditions that can be used later to evaluate the impact of the project. A watershed inventory should be thorough enough to analyze and understand the natural resources and human conditions within the watershed.

Determine what information you need

Ask questions such as

- What facts do we need to know about the watershed if we're going to achieve our vision of the watershed's desired state ?
- How much time and money do we want to spend doing this inventory?
- What data do we need in order to identify natural resource, social, and economic trends?
- How much data do we need in order to feel comfortable explaining the condition of the watershed to others?
- Should data be sampled from a few key points in the watershed, or should there be a total, detailed coverage of the watershed?
- What environmental indicators can we use?

Organize an inventory team

The inventory team should include anyone who has a knowledge of the local resources and a desire to help. Technical specialists from federal and state agencies could serve as team members or advisers. Local landowners within the project area should be encouraged to participate. Team members may be added as the need arises.

The inventory team is responsible for determining the plan for conducting the inventory. Involving the entire team is important, since diverse perspectives will generate good ideas. The inventory team should develop a list of work items that are essential to completing the inventory and the planning process. For each work item, it is important to clearly identify the following:

Purpose
Scope
Procedure
Desired output
Costs
Starting and completion dates
Responsible parties

The inventory team should work with the local watershed group to review resource concerns and the group's goals in the context of the ***desired future condition***, "what we want our watershed to be like." This is important if the inventory team is mostly agency folks who have not been involved in the group's early growth.

The team will want to utilize local knowledge and existing information to further define the concerns. Separate out the concerns that are based on seat-of-the-pants reasoning—"the water is muddy so it must be unhealthy"—to see if investigation will validate the concern.

The team will want to create a written plan of action for doing the watershed inventory. This plan should describe in detail what strategies will be used to identify problems and clarify goals. Each member should know what job they will do, when the job is to be done, and what the final product will be. Refer to Chapter 6 for more information on action planning.

Conduct public input meetings to enlist community support

The group, with the assistance of the inventory team, should conduct at least one public meeting to inform the general public of the planning effort unless public meetings have already been held. At this meeting the group should ask the community to identify problems and resource information that people in the community have in hand. Seek additional people from the meeting attendees to aid in the inventory.

Local citizens have a vital role to play. Volunteers can carry out many of the inventory responsibilities; it is best to have some idea how many are willing to participate, in order to plan an inventory that can be carried out. Once you have an idea of what you are going to inventory, you can begin to decide who you will need to conduct the inventory.

Technical personnel for the team can come from the Natural Resources Conservation Service, the Indiana Department of Natural Resources, Soil & Water Conservation Districts, Cooperative Extension Service, and Indiana Department of Environmental Management and similar agencies.

Collecting the data

1. Collecting reference material is important for conducting your inventory. Helpful references include
   - county soil surveys
   - Section 305(b) reports from and other water-quality assessment reports from agencies
   - diagnostic & feasibility studies or other studies that may have been done earlier
   - fish population studies
   - water-quality reports
   - Agricultural Statistics yearbooks
   - topographic and geological maps
   - county comprehensive plans, et cetera
2. Use established inventory procedures such as those found in many of the NRCS manuals and handbooks:
   National Agronomy Manual
   National Biology Manual
   National Forestry Manual
   Water Quality Indicators Guide: Surface Water, NRCS-TP-61
3. Check with other agencies and groups to determine what inventory procedures are available. Use worksheets or other guides to help keep the inventory process clean and traceable. Sample worksheets are included at the end of this section. Don't forget to designate somebody to compile the worksheets into a report.
4. Establish cause and effect relationships. When local citizens participate in inventories, the cause and effect relationships of problems become much clearer. When you are trying to determine *cause*, use the Why question. When you are trying to determine ***effect***, use the So What question.

   Example: During the summer of 1996 there was a massive algae bloom in the lake.Ask ***Why*** to lead you to the cause. (Why did it happen?) Ask ***So What*** to lead you to the effect. (So what happened then?)

5. Make use of 'resource quality criteria'. Quality criteria set the standards and conditions that you are trying to achieve. These criteria answer the question, "How clean should the water be," or "how many fish should we have." This will help identify resources that are below minimum standards. Resource quality criteria can be found in the Natural Resources Conservation Service (NRCS), ***Field Office Technical Guide***, Section III. Other sources of criteria are state water quality standards, rapid bioassessment protocols, and other measures.
6. Different aspects of the watershed will need to be inventoried. Information relating to ground and surface waters, cultural resources, threatened and endangered species, and laws and local regulations is usually included in a watershed inventory. Each watershed partnership will collect resource information specific to their situation, their identified concerns and their desired future condition. As an example, a watershed inventory for a lake might focus on these areas:

- Water quality
- Aquatic vegetation
- Fish populations
- Wildlife habitat
- Flood control
- Recreation
- Aesthetics

7. The EPA's ***Index of Watershed Indicators*** (http://www.epa.gov/iwi) looks at the following parameters to describe the condition and vulnerability of a large watershed:
   - Designated use attainment reports (IDEM 305(b) report)
   - Fish consumption advisories (State Health Department)
   - Source water quality for drinking water systems (local water utilities)
   - Contaminated sediments
   - Water pollution data
   - Wetland loss
   - Aquatic and wetland species at risk
   - Permit violations for dischargers
   - Urban runoff potential
   - Agricultural runoff potential
   - Population change
   - Hydrologic modification (dams)

It probably isn't possible to find all of those kinds of data for your particular watershed, but this list should provide you with ideas of what to search for. Remember that the overall point of a resource inventory is to provide the decision makers with information so they can make informed resource management decisions.

Watershed inventories should employ the best information available at the time; as new data become available they should be added to the inventory and the watershed plan should be adjusted accordingly. Rarely is a resource inventory an exhaustive study of the natural system. However, if the inventory can clarify resource concerns, help local people understand cause and effect relationships, and set a course to reach a desired future condition, it has achieved its goal.

The information collected by the inventory team should be presented to the watershed group and to the public via meetings or other media. The team should be completely non-judgemental in its presentation. Maps, tables, charts and other visual tools will make the information easier to digest. The team should not try to draw too many conclusions from the information; it is not their job to make decisions for the watershed group. The team should prepare a written report detailing what they did and what they discovered; this report will become a part of the watershed plan.

Attachment 1

WATERSHED INVENTORY WORK ASSIGNMENTS

Name of Project _____ Date _____

Work Item _____ Prepared by: (Team Members) _____

_____

_____

A. Kind of information needed:

B. Is the information available?

❑ **Yes** (Where is it and who has it?)

❑ **No** (Proceed with worksheet.)

C. How much detail do we need?

D. What format do we want the data in? (map, table, narrative, etc.)

E. Potential procedures for collecting information:

	Procedure	How long will it take?	Estimated Cost
1.			
2.			
3.			

F. Schedule:

Procedure _____

Time (Days) _____ Estimated Cost _____

Start Date _____ Finish Date _____

Anything we need to do first? _____

_____

_____

G. Person(s) responsible for collecting this information: _____

_____

_____

Finding the information you need

When your group is in the initial information-gathering stage, tracking down sources can be very frustrating. The following is a list of resources, the agencies that have data about those resources, and the type of data that may be available ***(Note: This list is not all-inclusive)***.

Be aware that in some cases the information will be in the form of "raw data." In this case you will need to ask for assistance from the agency that collected the data, or a technical assistance agency, for analysis and interpretation.

Phone numbers for most of the agencies listed are in APPENDIX B: CONTACTS.

Resource	Agency	Type of Information
Soil	Natural Resources Conservation Service (contact the local county SWCD office)	Soil Surveys, published for each county, contain soil maps and detailed descriptions about the soil's physical characteristics, uses, and hazards. By 2002, many soil surveys will be available on CD-ROM. These can also supply erosion rates, tillage practices.
Land Use and Cover	SWCD County offices	Topographic maps, aerial photographs, and aerial slides may be viewed at the office; photographs may be purchased through the Farm Service Agency.
	NRCS: the National Resource Inventory (Contact the state NRCS office)	Land use, cover, crop, and other landscape characteristics have been recorded every five years since 1977. Reports detailing land use trends are published.
	GAP Analysis. Carried out by the U.S. Fish & Wildlife Service in Indiana; contact their state office	Satellite data is used to provide maps of land use, vegetative cover, etc. There will be a charge for some maps.
	Local Planning Departments	Numbers of building and subdivision permits; county master plans; transportation plans; county demographics.
	Agricultural Statistics	Crop, livestock and farm statistics. Contact Purdue Cooperative Extension offices.

Resource	Agency	Type of Information
Aquatic Life (including fish)	IDNR Fish Population Studies	Contact the Division of Fish & Wildlife for specific studies.
	IDEM Fish Population, Fish Tissue, and Macroinvertebrate Studies	Contact the Assessment Branch at IDEM for specific studies and reports.
	Indiana State Department of Health	Annually published Fish Consumption Advisories.
Water	IDEM Water Quality Monitoring: contact the Assessment Branch for data on specific streams and lakes	Extensive water chemistry data, some showing trends over many years and some more recent, also for groundwater. Ask for assistance with interpreting the data.
	Volunteer monitoring groups; data in *Riverbank* web site	Contact local groups. See the Riverwatch and Riverbank internet sites. (Appendix A)
	U.S. Geological Survey	Water chemistry data on certain watersheds and for groundwater. Contact the USGS state office. USGS also delineates watersheds for the Hydrological Unit Code maps and publishes topographic maps.
	IDNR Diagnostic and Feasibility studies done through Lake & River Enhancement	Contact L&RE for specific reports on certain waterbodies.
	Army Corps of Engineers	If the reservoir is managed by ACOE, there will be water quality data taken each year; contact the manager of the dam for the specific lake.
	Local Water Utilities	Contact your drinking water suppliers for data on both upstream (pre-treatment) and post-treatment water.

Resource	Agency	Type of Information
Water (cont'd)	Streams/watersheds	USGS topographic maps, USGS watershed maps, IDNR Divisions of Water stream maps
	Drainage: local drainage boards. Also stormwater management systems.	Condition & location of regulated drains; cost of cleaning & maintaining drainage systems.
	Impaired waters	IDEM 305(b) report, can be found in public libraries; or the annual 303(d) list of impaired water bodies prepared for EPA, found on the IDEM website.
	Drinking water sources	IDEM Drinking water branch, or EPA's *Surf Your Watershed* website.
	Water budgets (quantity)	IDNR Division of Water
	Wetlands	NRCS inventory maps, USF&WS inventory maps
	Protected & designated waters	IDNR Division of Water list of exceptional use waters
	Point source outfalls (permitted facilities with something that comes out of a pipe)	IDEM Permits Branch, or EPA's EnviroFacts website.
Geology	Indiana Geological Survey	Call their Bloomington office for reports and maps of geologic features and hazards.
	USGS	Call the state office or visit their website for map information.
Air Quality	IDEM Air Branch	Contact for information
Endangered and Threatened Species	IDNR Division of Nature Preserves maintains the Heritage Database of E&T species locations, with the Nature Conservancy	Information on E&T and on the normal range of vegetation and wildlife. Contact the Division office.

Resource	Agency	Type of Information
Vegetation & Forestry	NRCS (Agronomy)	Seeding specifications, plant suitability; local offices.
	Cooperative Extension	Planting specifications, plant suitability; local office.
	IDNR Division of Forestry	Technical assistance with establishing and managing woodlands. Contact the District Forester in your area.
Livestock	Ag statistics & ag census data	Numbers of livestock. Contact Purdue co-op extension
	Animal Waste	NRCS: study on animal waste production by county; infomation on animal waste management.
Wildlife	IDNR Division of Fish & Wildlife	Technical assistance. Contact District Wildlife Biologists.
	U.S. Fish & Wildlife Service	Technical assistance. Contact the state office.
Human Population Statistics	Census Data	Population density, trends, etc. Contact the Indiana Department of Commerce or use the census internet information or your local library.
	Chambers of Commerce	Economic trends, employment trends. Contact local Chamber.
Pesticide & Fertilizer Use	Indiana Office of the State Chemist	Tracks purchases for the state by year.
Waste Disposal	Local health department	Septic & sewer information, local landfill information.
	IDEM Office of Solid & Hazardous Waste	Permit information, information on the functioning and lifespan of existing landfills, information on toxic materials.

Chapter Four

Technical Assistance

FOCUS

- Utilizing technical assistance
- Working with other watershed groups in Indiana

After the group has developed concrete goals, conducted an inventory of the watershed and gathered all relevant information on existing conditions, it is time to evaluate what could be changed in the watershed to address the group's concerns. At this time, it is useful to involve technical assistance agencies. These agencies can help the group identify practices and management techniques that would bring about the desired changes.

Technical assistance agencies

The following agencies have offices in each county or group of counties in Indiana:

- Soil & Water Conservation Districts (SWCD)
- Natural Resources Conservation Service (NRCS)
- Indiana Department of Natural Resources (IDNR)
- Purdue Cooperative Extension Service (CES)

Each county has a **Soil & Water Conservation District** office. The District may have one or more technical assistance personnel, ranging from technicians, conservation planners, or engineers, to education specialists. These people work with landowners and local governments, usually without charge.

Each county SWCD is served by an **NRCS District Conservationist**. The DC is responsible for administering NRCS programs for private landowners and for providing soil & water conservation planning and design assistance to landowners, land operators, and local governments. There also may be NRCS technicians, engineers, soil scientists, wetlands specialists, or agronomists in the office. NRCS services are free.

In some SWCD offices, **IDNR Division of Soils** houses **Resource Specialists** who administer IDNR programs such as the Lake & River Enhancement cost-share program and clean water Indiana. **IDNR Urban Conservation Specialists** also are positioned across the state to assist in administering the "Rule Five" erosion control law for land-development activities. **IDNR District Foresters** and **District Wildlife Biologists** often serve more than one county and are housed in a variety of locations. These specialists provide design assistance and management plans, and administer incentive programs for landowners.

Purdue Cooperative Extension Education Specialists, housed in the "Extension Office" in each county, can provide information, publications, access to field days and workshops, and knowledge of the county's agriculture and planning processes.

If a **college or university** is located near your watershed, find out what specialties it has that may help you. Many universities do GIS work on contract, or have public policy or environmental departments that could provide assistance to your group.

Talk to your local **health department** to see if some water testing could be done through them at the Indiana State Department of Health laboratories. (See also "Water Quality Monitoring," Chapter Eight.)

For more information on contacting agency offices and personnel, see APPENDIX B: CONTACTS for phone numbers. For information on programs administered by the different agencies, see Funding, Chapter Seven.

Working with other watershed groups in Indiana

Many groups have evolved in Indiana to address citizens' concerns about lakes or streams. These groups are in varying stages of growth. Some are newly formed, and some have been in existence for over 20 years. The following table lists the groups that we know about at this time. Since new groups are constantly forming, we welcome information about groups that we have missed or changes in information about groups on the list.

Watershed partnerships benefit from sharing their challenges and successes with each other. In 1997, a network of watershed partnership coordinators was developed under the sponsorship of the Indiana Association of Soil & Water Conservation Districts and NRCS. They plan to meet periodically to discuss mutual issues. Meeting notices are sent out by the Indiana Association of Soil and Water Conservation Districts. Contact that office for more information, or contact one of the coordinators on the following list.

Watershed Projects in Indiana

* See end of table for acronyms

Project Area	Type of Project	Supporting Agency or Program	Sponsor	County	Watershed	Start
Bass Lake	L&RE - Diagnostic Study	IDNR	Lake Association	Starke	Kankakee	2000
Beaver Lake Ditch	Restoration	Non-profit	The Nature Conservancy	Newton	Kankakee	1997
Big Walnut-Deer Creek	EQIP Land Treatment	NRCS	Conservation Workteam	Putnam & Hendricks	Eel-Big Walnut	1998
Blue River (Upper Big Blue)	Flood Control	Big Blue River Conservancy	Conservancy	Henry & Rush	Driftwood	1950's
Blue River Karst	EQIP Land Treatment	NRCS	Conservation Workteam	Central IN karst area	Several	1998
Blue River Noble Co.	L&RE - WLT	IDNR	SWCD	Noble & Whitley	Eel-Wabash	1998
Blue River Rip. Corr. Reforestation	S 319 restoration	IDEM	The Nature Conservancy	Washington-Crawford-Harrison-Floyd	Blue-Sinking	1997
Blue River South	Restoration/protection	Non-profit	The Nature Conservancy		Blue-Sinking	
Brewster Ditch	L&RE - WLT	IDNR	SWCD	Adams	Upper Wabash	1997
Brine Remediation	S 319 assessment/ restoration	IDEM	Four Rivers RC&D; Southwest indiana Brine Coalition	Southwest Indiana	Patoka, Lower Wabash	1999
Bruce Lake	L&RE - Construction 1989, WLT 1998; Design on Overmyer Ditch, 1994	IDNR	SWCD	Fulton & Pulaski	Tippecanoe	1989
Brush Creek	L&RE - WLT	IDNR	SWCD	Owen-Putnam--Morgan	Lower White	1998
Cedar Creek	EQIP Land Treatment	NRCS	Conservation Workteam	Allen-Dekalb-Noble	Several	1998
Cedar Lake	S319 restoration	IDEM	Cedar lake Enhancement Association	Lake	Kankakee	2000
Cedar Lake Watershed Protection	S 319 restoration	IDEM	Cedar Lk Enhancement		Kankakee	

Watershed Projects in Indiana

* See end of table for acronyms

Project Area	Type of Project	Supporting Agency or Program	Sponsor	County	Watershed	Start
Chapman Lakes	L&RE Diagnostic Study	IDNR	Lake Association	Kosciusko	Tippecanoe	2000
Core-4 Demonstration	S 319 restoration	IDEM	Four Rivers RC&D	Putnam-Hendricks-Owen-Green-Daviess-Knox	Eel-Big Walnut & Lower White	1999
Crooked Creek	EQIP Land Treatment	NRCS	Conservation Workteam	Steuben	St Joseph-Lake Michigan	1998
Crooked/Brush Creeks	L&RE - WLT	IDNR	SWCD	Clay	Eel-Big Walnut	1996
Deer Creek	EQIP Land Treatment	NRCS	Conservation Workteam	Carroll	Middle Wabash-Deer	1998
Dry, Solomon, Whetton Creeks	L&RE - Diagnostic	IDNR	SWCD	Elkhart	St Joseph-Lk Michigan	2000
Eagle Creek E. coli Genotyping	S 319 assessment	IDEM	Farm Bureau	Marion-Boone-Hendricks	Upper White	1999
Eagle Creek Watershed Protection	S319 - Assessment, Planning, Restoration	IDEM	Farm Bureau	Marion-Boone-Hendricks	Upper White	1997
East Fork of Whitewater River	PL 566 Project	NRCS			Whitewater	
Elkhart	104(b)(3) Project - education/outreach	IDEM	City of Elkhart		St Joseph Lake Michigan	1999
Fall Creek TMDL	Total Maximum Daily Load (TMDL) being conducted; S319 funding	IDEM	IDEM	Marion	Upper White	1999
Fish Creek	EQIP Land Treatment	NRCS	Conservation Workteam	Owen	Eel Big Walnut	1998
Fish Creek, St Joseph River	Restoration/ protection	Non-profit	The Nature Conservancy	Steuben	St Joseph-Maumee	1992?
Fish Creek, St Joseph River	EQIP Land Treatment	NRCS	Conservation Workteam	Steuben	St Joseph-Maumee	1998
Five Lakes	104(b)(3) Project - restoration	IDEM	Five Lakes Conservation District		St Joseph Lk Michigan	1998

Project Area	Type of Project	Supporting Agency or Program	Sponsor	County	Watershed	Start
Flat Rock Watershed Coordinator	S 319 restoration	IDEM	Rush County SWCD	Rush	Flat Rock	
Flat Rock River Watershed Project	S319 Restoration & septic replacement	IDEM	SWCD	Rush	Flat Rock	
Gilbert (Galbraith) Lake	L&RE Pre-investigation 1996; WLT 1997	IDNR	Poor Handmaids of Jesus Christ	Marshall	Kankakee	1996
Glen Flint Lake/Owl Creek	L&RE WLT	IDNR	SWCD	Putnam	Eel Big Walnut	1996
Goose -Loon Lakes	L&RE Diagnostic 1990; Construction on Friskney ditch, 1998; also WLT	IDNR	SWCD	Whitley-Noble	Tippecanoe	1990
Grand Cal	104(b)(3) Project - assessment	IDEM			Calumet-Galien	1996
Grand Calumet TMDL	Total Maximum Daily Load (TMDL) being conducted	IDEM	IDEM	Lake	Calumet-Galien	1999
Hall Creek	EQIP Land Treatment	NRCS	Conservation Workteam	Dubois	Patoka	1998
Hanna & Silver Creeks	L&RE Diagnostic	IDNR	SWCD	Union	Whitewater	2000
Hardy Lake	L&RE Diagnostic	IDNR	SWCD	Scott	Muscatatuck	1998
Highland-Pigeon WS Coord	S 319 planning/ restoration	IDEM	Four Rivers RC&D	Gibson-Warrick-Posey-Vanderburg	Highland-Pigeon	
Indian Creek	L&RE WLT	IDNR	SWCD	Tippecanoe	Middle Wabash-Little Vermilion	1996
Indian Lake	S 319 restoration	IDEM	Craig Middle School	Marion	Upper White	1999
Indian Lakes Chain	L&RE Engineering Feasibility	IDNR	Five lakes Conservation Club	Lagrange	St Joseph-Lake Michigan	
Integrated Nutrient Management	S 319 restoration	IDEM	Carroll Co. SWCD	Carroll	Middle Wabash-Deer & Wildcat	1999

Project Area	Type of Project	Supporting Agency or Program	Sponsor	County	Watershed	Start
Juday Creek	S319 streambank stabilization	IDEM	St. Joseph Co Drainage Board	St. Joseph	St. Joseph Lk Michigan	
Keans Creek	EQIP Land Treatment	NRCS	Conservation Workteam	White	Tippecanoe	1998
Kilmore Creek Land Treatment	S 319 restoration	IDEM	Clinton Co. SWCD	Clinton	Wildcat	1999
Kimberlin Creek	EQIP Land Treatment	NRCS	Conservation Workteam	Scott	Muscatatuck	1998
Kokomo Creek	L&RE WLT	IDNR; IDEM	SWCD	Howard	Wildcat	1999
Kokomo Creek TMDL	Total Maximum Daily Load (TMDL) conducted	IDEM	IDEM	Howard	Wildcat	1999
Lake George	104(b)(3) Project - planning	IDEM	City of Hammond		4040001	1996
Lake Lemon	L&RE Construction, 1990; Diagnostic Study; WLT 1992	IDNR	Lake Lemon Conservancy District	Monroe	Lower White	1990
Lake Maxinkuckee Stormwater Treatment	S 319 restoration	IDEM	Town of Culver	Marshall	Tippecanoe	2000
Lake Michigan Beaches (E. coli impacts)	104(b)(3) Project - assessment	IDEM	Laporte Co Health Dept		4040001	1998
Lake Waveland	L&RE Diagnostic	IDNR	SWCD	Montgomery--Parke	Middle Wabash Little vermilion	1988
Lake Wawasee	L&RE Diagnostic; WLT 1996-;	IDNR	Wawasee Area Conservancy Foundation	Kosciusko & Noble	St Joseph-Lake Michigan	1994
Land Use Conversion Project	S 319 restoration	IDEM	Maumee River Basin Comm		Upper Maumee, Auglaize, St Marys	
Limberlost - Loblolly Swamp	Indiana Wetland Conservation Plan; former S319 restoration	IDNR, IDEM & others	Friends of the Limberlost		Upper Wabash	1993?
Little Creek	EQIP Land Treatment	NRCS	Conservation Workteam	Jefferson	Muscatatuck	1998

Project Area	Type of Project	Supporting Agency or Program	Sponsor	County	Watershed	Start
Little Deer Creek	L&RE WLT	IDNR	SWCD	Putnam	Eel-Big Walnut	1997
Little Pipe Creek	L&RE WLT	IDNR	SWCD	Miami	Upper Wabash	1995
Livestock Management Planning	S 319 technical assistance	IDEM	LaGrange Co. SWCD	Lagrange	St Joseph-Lake Michigan	1999
Lower Big Raccoon	EQIP Land Treatment	NRCS	Conservation Workteam	Parke	Middle Wabash-Little Vermilion	1998
Lower Eel-Wabash	EQIP Land Treatment	NRCS	Conservation Workteam	Miami-Cass	Eel-Wabash	1998
Lower White	EQIP Land Treatment	NRCS	Conservation Workteam	Greene	Lower White	1998
Lower White & Eel-Big Walnut	S319; CORE4 Program for land treatment	IDEM	Resource Conservation & Development Councils	Putnam-Hendricks	Eel-Big Walnut	1999
Lower White River Technical Assistance	S 319 technical assistance	IDEM	Four Rivers RC&D	Knox-Daviess-Pike	Lower White	2000
Mariah Creek	PL566	NRCS		Knox-Sullivan	Middle Wabash-Busseron	
Maumee River	S319 and others; restoration & easements	IDEM	Maumee River Basin Commission	Allen-Adams	Upper Maumee, Auglaize, St Marys	
McFadden Creek	S 319 assessment	IDEM	Four Rivers RC&D	Posey & Vanderburgh	Highland-Pigeon	1999
Middle Fork of Buseron Creek	L&RE WLT	IDNR	SWCD	Sullivan	Middle Wabash-Busseron	1999
Middle Fork Whitewater	EQIP land treatment	NRCS	Conservation Workteam	Wayne	Whitewater	1998
Middle Fork Whitewater	L&RE WLT	IDNR	SWCD	Wayne-Randolph-Union	Whitewater	1997
Mine Spoil Absorption Medium	S 319 restoration	IDEM	Indiana University		Several	
Modoc	EQIP land treatment	NRCS	Conservation Workteam		Several	1998

Watershed Projects in Indiana

* See end of table for acronyms

Project Area	Type of Project	Supporting Agency or Program	Sponsor	County	Watershed	Start
Mudd Pine Creek	L&RE Diagnostic	IDNR	SWCD	Benton	Middle Wabash-Little Vermilion	2000
Nitrate Study, E. Fork White River	S 319 assessment	IDEM	Indiana Geological Survey	Jackson	Upper East Fork White	
North Fork Vernon Fork of Muscatatuck	L&RE WLT	IDNR	SWCD	Jennings-Ripley-Decatur	Muscatatuck	1997
NPS Pollution Assessment (GIS)	S 319 planning	IDEM	Huntington Co. SWCD	Huntington	Upper Wabash-Salamonie	2000
Nutrient Management Specialist	S 319 restoration	IDEM	Lincoln Hills RC&D	Lawrence-Orange-Washington	Lower East Fork White-Blue Sinking	2000
Nutrient Management-Dubois Co.	S 319 restoration	IDEM	Four Rivers RC&D	Dubois-Pike	Patoka	
On-site Waste - Constructed Wetlands	S 319 restoration	IDEM	DeKalb County SWCD	Dekalb	St Joseph-Maumee	
Otsego Ball Lake	L&RE Diagnostic Study	IDNR	Lake Association	Steuben	St Joseph-Lk Michigan	2000
Patoka - Animal Waste Management Specialist	S 319 technical assistance	IDEM	Four Rivers RC&D	Dubois	Patoka	1996
Patoka (South Fork)	S319, Appalachian Clean Streams; restoration	NRCS, OSM, IDNR Recl., SWCDs	South Fork Patoka Steering Committee; Four rivers RC&D	Pike-Dubois	Patoka	1997
Pigeon Creek	S319 restoration, diagnostic	IDEM	SWCD	Gibson-Vanderburgh-Posey-Warrick	Highland-Pigeon	1999
Pigeon Creek	L&RE WLT, 1993; Diagnostic, 1998-9	IDNR	SWCD	Gibson-Vanderburgh--Posey-Warrick	Highland-Pigeon	1993
Pigeon Creek	EQIP land treatment	NRCS	Conservation Workteam	Steuben	St Joseph-Lake Michigan	1998

Watershed Projects in Indiana

* See end of table for acronyms

Project Area	Type of Project	Supporting Agency or Program	Sponsor	County	Watershed	Start
Pigeon Creek	Restoration/ protection	Nonprofit	The Nature Conservancy	Steuben	St Joseph-Maumee	1995?
Pigeon Creek Bank Stabilization	S 319 restoration	IDEM	Evansville Parks Dpt.	Vanderburg	Highland-Pigeon	1999
Pigeon Roost Creek	EQIP land treatment	NRCS	Conservation Workteam	Scott	Muscatatuck	1998
Pike Lake	L&RE WLT	IDNR	SWCD	Kosciusko	Tippecanoe	1996
Pine Lake	L&RE Construction pending	Laporte Co, L&RE, construction	City of Laporte	Laporte	St Joseph-Lake Michigan	2000
Pitcher Lake	S319 pending	IDEM	SWCD	Posey	Lower Wabash	1999
Reclamation Coordinator	S 319 restoration	IDEM	Sycamore Trails RC&D	Putnam	Eel Big Walnut-Middle Wabash	1999
Revegitation and Restoration	S 319 restoration	IDEM	Pheasants Forever		Several	1999
Rhodes Creek	L&RE WLT	IDNR	SWCD	Morgan	Eel-Big Walnut	1995
Sand Creek (see also Upper Sand Creek)	S319, planning/ assessment	IDEM	SWCD	Decatur	Upper East Fork White	1999
Sandy Branch	EQIP land treatment	NRCS	Conservation Workteam	Jackson	Muscatatuck	1998
Septic Demonstration	S 319 restoration	IDEM	Arrow Head RC&D		Kankakee	2000
Septic System Improvement	S 319 restoration	IDEM	Rush Co. SWCD	Rush-Henry	Flat Rock	
Sinking Fork of Silver Creek	EQIP land treatment	NRCS	Conservation Workteam	Clark	Silver-Little kentucky	1998
Slate Creek	EQIP land treatment	NRCS	Conservation Workteam	Martin-Daviess	Lower East Fork White	1998
South of Valparaiso Moraine	EQIP land treatment	NRCS	Conservation Workteam	Laporte	Kankakee	1998
Southwest IN	S319 assessment/ prioritization	IDEM	Southwest Indiana Brine Coalition	Southwestern Indiana	Patoka & others	1998

Project Area	Type of Project	Supporting Agency or Program	Sponsor	County	Watershed	Start
Spring Mill Lake	S 319 Assessment	IDEM	Indiana Geologic Survey	Orange	Lower East Fork White	1998
St Joseph & Maumee	L&RE WLT	IDNR	SWCD	Allen	St Joseph-Maumee	2000
St Joseph River Initiative	S 319 restoration/ planning	IDEM	Allen Co. SWCD	Allen	St Joseph-Maumee	1997
St Joseph Septic Cost-Share	S 319 restoration	IDEM	Dekalb Co. SWCD	Dekalb	St Joseph-Maumee	
St. Marys Watershed Project	S 319 restoration	IDEM	Allen Co. SWCD	Allen	St Marys	1999
St. Marys Watershed Project	S 319 restoration	IDEM	Adams Co SWCD	Adams	St Marys	1999
Sugar Creek	EQIP land treatment	NRCS	Conservation Workteam	Vigo	Middle Wabash-Busseron	1998
Tanners Creek	private funding	NRCS, IDEM	SWCD	Dearborn	Middle Ohio-Laughery	1999
Teays Valley Mobile Education	S 319 education	IDEM	Tippecanoe Co. SWCD	Tippecanoe	Middle Wabash-Wildcat	1999
Tell City - CSO assessment	104(b)(3) Project - assessment	IDEM	Tell City		5140201	1999
Tippecanoe Watershed	S 319 planning/ restoration; Nature Conservancy funding	IDEM	The Nature Conservancy	Several	Tippecanoe	2000
Trees for the New Millennium	S 319 restoration	IDEM	IDNR Forestry		Several	2000
Trittipo Ditch Bank Stabilization	S 319 restoration	IDEM	Marion Co. SWCD	Marion	Upper White	2000
Twelve Mile Creek	L&RE WLT 1998	IDNR	SWCD	Cass-Miami	Eel-Wabash	1998
Upper Eel River Manure Mgt. Project	S 319 restoration	IDEM	Sycamore Trails RC&D& Putnam County SWCD	Putnam	Eel-Big Walnut	1999
Upper Fourteen Mile	EQIP land treatment	NRCS	Conservation Workteam	Clark-Jeffe-rson-Scott	Blue-Sinking	1998

Project Area	Type of Project	Supporting Agency or Program	Sponsor	County	Watershed	Start
Upper Sand Creek	EQIP land treatment	NRCS	Conservation Workteam	Decatur	Upper East Fork White	1998
Upper South Branch Elkhart	EQIP land treatment	NRCS	Conservation Workteam	Noble	St Joseph-Lake Michigan	1998
Upper Tippecanoe	Restoration/ protection	Nonprofit	The Nature Conservancy	White-Pulaski-Cass-Fulton-Marshall-Kosciusko-Whitley	Tippecanoe	1999
Upper White River	S319 restoration	IDEM	Randolph Co. SWCD	Randolph	Upper White	1999
Wabash	EQIP land treatment	NRCS	Conservation Workteam	Sullivan	Middle Wabash-Busseron	1998
Wabash	EQIP land treatment	NRCS	Conservation Workteam	Fountain	Middle Wabash-Little Vermilion	1998
Wabash River Expedition	S 319 education	IDEM	Sullivan Co. SWCD	Sullivan	Middle Wabash-Busseron	1999
Waste Manage-ment Systems	S 319 restoration	IDEM	Four Rivers RC&D		Lower White	2000
Wastewater Wetland Demonstration	S 319 restoration	IDEM	Johnson Co. SWCD	Johnson	Driftwood	2000
Wea Creek	EQIP land treatment	NRCS	Conservation Workteam	Tippecanoe	Middle Wabash-Little Vermilion	1998
West Boggs Lake	L&RE Construction 1990; WLT 1993	IDNR	Co Parks & Rec	Daviess	Lower East Fork White	1993
West Fork Whitewater	EQIP land treatment	NRCS	Conservation Workteam	Fayette	Whitewater	1998
West Otter Lake	L&RE Diagnostic 1990; WLT 1996	IDNR	SWCD	Steuben	St Joseph-Lake Michigan	1996
White River	private funding	Friends of White river			Upper White	1999
White River Land Treatment	S 319 restoration	IDEM	Randolph Co. SWCD	Randolph	Upper White	1999
Wildcat Creek	L&RE WLT	IDNR	SWCD	Tippecanoe-Clinton	Wildcat	1992
Wildcat Creek, Jerome East	S 319 restoration	IDEM	Howard Co. SWCD	Howard	Wildcat	1999

Watershed Projects in Indiana

* See end of table for acronyms

Project Area	Type of Project	Supporting Agency or Program	Sponsor	County	Watershed	Start
Wildcat Technical Assistance	S 319 technical assistance	IDEM	IASWCD	Tippecanoe-Carroll--Clinton-Howard-Tipton	Wildcat	1999
Winona Lake	EQIP land treatment	NRCS	Conservation Workteam	Kosciusko	Tippecanoe	1998
Witmer lake	L&RE Engineering Feasibility 1990; WLT 1997	IDNR	SWCD	Lagrange-Noble	St Joseph-Lake Michigan	1997
Wolf Lake Conservation Area	S 319 restoration	IDEM	Hammond Parks and Rec.	Lake	Calumet-Galien	1999
WQ Monitoring and Education	S 319 assessment/outreach	IDEM	Clinton Co. SWCD	Clinton	Wildcat	1999

ACRONYMS

CSO: ..... Combined Sewer Overflow
EQIP: ..... Environmental Quality Incentive Program, U.S. Department of Agriculture
IDEM: ..... Indiana Department of Environmental Management
IDNR: ..... Indiana Department of Natural Resources
L&RE: ..... IDNR Division of Soil Conservation, Lake & River Enhancement Program
NPS: ..... Nonpoint Source
NRCS: ..... Natural Resources Conservation Service, U.S. Department of Agriculture
PL566: ..... Public Law 566 - Watershed Protection Program
RC&D: ..... Resource Conservation and Development Council
S319: ..... Nonpoint source pollution projects funded by the Section 319 Grants Program managed by IDEM's Watershed Management Section
SWCD: ..... Soil & Water Conservation District
WLT: ..... Watershed Land Treatment
WS: ..... Watershed

Version: December 5, 2000
Source: Susan McLoud, IDEM Watershed Management Section, 317-232-0019
For more information, call (800) 451-6027, press 0 and ask for extension 2-0019
Please let us know about any changes or additions to this list. Thank You!

Chapter Five

Finding Solutions, Making Decisions

FOCUS

- Best Management Practices
- Deciding what approach to take
- Prioritizing the work

BMPs are the first line of defense for watershed projects.

Best Management Practices

The term **"Best Management Practice"** or **"BMP"** applies to structural and management practices used in agriculture, forestry, urban land development, and industry to reduce the potential for damage to natural resources from human activities.

– **Practice:** Method or customary way of doing something. In this context, a specific practice is recognized as having standards and specifications developed by an agency or institution with expertise in the relevant fields. A practice may be structural, something that is built or involves changes in land forms or equipment, or it may be managerial, a specific way of using or handling infrastructure or resources.

– **Management:** In this context, the way we do business or carry out work. Practices are incorporated into a management system. For instance, a logger implements riparian buffers and water bars to lessen the impact of timber harvesting on natural resources. The logger learns to ***manage*** his work differently.

– **Best:** In every field of work, there are several methods for reaching a goal. Based on impacts to natural resources, efficiency, economics, and the needs of the individual operation, technical assistance is provided to landowners and operators to select the practices best suited to all of their goals. Technical agencies and institutions work to develop new and innovative practices to meet the changing needs of industry and agriculture and to disseminate information concerning new practices.

It is not enough simply to present a laundry list of practices. A Best Management Practice must have been selected through a conscious planning process designed to inventory resources and needs, determine available alternatives, evaluate alternatives, make decisions, and follow up the selection of practices withonitoring and evaluation to determine whether they are having the desired effect.

Practices that can be used to address nonpoint source pollution are too numerous to list here. **The most authoritative *sources* of BMPs in Indiana** are listed instead:

- ***NRCS Field Office Technical Guide* (FOTG).** A five-volume work found in every county SWCD office, containing standards and specifications for conservation practices, soils information for the county, planning considerations, conservation practice effects, and more. Adjuncts to the FOTG are the *Engineering Field Handbook*, which contains design methods for the practices described in the FOTG; the *National Agronomy Handbook*; the *Animal Waste Handbook*; and the *National Planning Procedures Handbook*.
- ***Indiana Drainage Handbook.*** Developed by a consortium of agencies and organizations, this manual contains practices for all aspects of agricultural and non-agricultural drainage activities. There is a copy in each SWCD county field office.
- ***Indiana Erosion Control Handbook for Developing Areas.*** Developed by IDNR and partner agencies, this resource contains practices for construction sites. There is a copy in each SWCD county office, and copies are available for $25 from IDNR Division of Soils. It is currently being revised.
- ***Logging and Forestry BMPs for Water Quality in Indiana.*** Free, from the IDNR Division of Forestry. Contains practices for the timber industry and private woodlot owners.
- New technology emerges constantly. Check with technical assistance agencies, universities, and the Web for new practices. Have your technical committee investigate the value of these.
- CROPS, NAPRA, AGNPS, SWERBB, and other **computer models** that help sort options and predict the results of different alternatives that have been developed. Contact technical assistance agencies for more information.

In addition to practices aimed at nonpoint source pollution, the group may have concerns about **point sources.** Point sources have distinct discharge points such as municipal or industrial discharge pipes. These concerns can be taken up with the responsible agency, which in most cases is the Indiana Department of Environmental Management. Changing the amount or nature of point source discharges may be beyond the group's scope, but some alternatives might include getting involved in the public hearing process for new permits, requesting compliance information, or working with local industry to promote more effective technology.

The group may want to change **land use** trends in the watershed; for example, encourage cluster housing in new subdivisions, promote regional storm water management, advocate rezoning in certain environmentally sensitive areas, or divert planned transportation corridors. In each case ask the following:

- What is the activity that is causing concern?
- What is it about this activity that raises concern?
- What would the group want to change?
- Is it practical for the group to take on this particular issue, or is there a partner who could carry out the effort?
- Is there an existing effort to address this concern that the group could support?
- Who is responsible for the activity? Who are the contact persons?

With the aid of technical agencies and individuals, the group should ***brainstorm every possible alternative for addressing concerns and bringing about desired changes,*** no matter how far out some of them may sound. This is not the time to judge the merits of solutions. Just try to get them all on the table.

Deciding what approach to take

Once the group has listed every conceivable method for reaching its goals, it's time to analyze thealternatives and decide which approaches or strategies best fit the situation. You may need to make clear to yourselves or to others why one approach is preferred over another. There are a number of questions you can ask to help at this stage:

- Does this approach address our primary concerns?
- Will it help us meet our goals?
- What would be the effects on the environment?
- Can we measure the effects?
- How long would it take to see results?
- What would this approach cost in terms of money and manpower?
- Do we have (or can we get) the technical expertise to do this?
- Would this approach be acceptable to the people in this watershed?
- Would this approach complement other projects that we already plan to do?

Prioritizing watershed work

When the group has decided which methods it will utilize to address problems, there may be more work on the table than it is reasonable to attempt. In this case you will need to determine which areas will receive priority treatment. It's a good time to bring out any maps developed during the inventory phase, list the problems and favored solutions, and ask these questions:

- **Can we fix it?** If a problem is beyond the scope of the group, such as cleaning up a Superfund site or bringing back the passenger pigeon, table it. If it is doable, but not by this group, refer it to the appropriate party.
- **Is somebody willing to do it?** If the "fix" involves land use changes or management changes that are not presently acceptable to the community, or if the residents are just not concerned or committed on some issue, consider postponing that problem until a later date. Instead, work first to develop a track record of successes to increase your profile in the community, and/or wait until you have more resources.
- **Will it help us meet our targets?** If the problem and solution are manageable, but they don't relate to your mission and goals, consider finding another home for them.
- **Will the resources stretch that far?** If you expect to receive a $100,000 grant and installing this practice in the entire watershed will take $500,000, narrow the focus of that particular project.
- If the answer to all these questions is "yes," go for it!

Go to the next prioritization step when you have filtered the selected problems and solutions through the above questions and there is still too much work on the table, try the following steps:

Lay out your maps and divide the watershed into smaller sections. (You may have done this during the inventory phase). Decide what parameters make sense for ranking these **sub-watersheds.** For instance, if fish habitat is a primary concern, parameters could include dissolved oxygen, a habitat index expressing the condition of the stream bottom and streambank vegetation, and a measure of the food supply for fish (macroinvertebrate index).

Placing important pollution sources on a watershed map, linked with water-quality data and land uses, can help you target areas in the watershed for your activities. If a GIS system is not available, mylar overlay maps can be used as simple analysis tools.

If the data does not exist to rank the sub-watersheds, the group can return to the inventory phase in order to gather the information it needs, or choose another set of characteristics to rank the watersheds. For instance, you could look at land use changes, livestock numbers, agricultural practices or housing starts to gauge the vulnerability of each sub-watershed to pollution.

When the sections or sub-watersheds have been ranked, pick one or two areas in which to begin. Starting small has many advantages. You could call this area a "pilot" or "start-up" project. Use this first small project to assess how you will do more work in the future and build on your successes.

Chapter Six

Finally— Creating a Real Plan!

FOCUS

- Who needs a watershed plan?
- Elements of a watershed plan
- What should we do after we write the plan?

Your watershed group has been meeting for some time by now, and you are wondering when, if ever, this Guide is going to tell you how to put together a watershed plan!

The group is ready to document the plan on paper when

- the members have learned to work together with respect and trust, all critical interests are represented, and they are able to make and support decisions;
- concerns have been voiced, a vision has been developed, and members have drawn up problem statements and measurable goals;
- the watershed has been inventoried and all the information is available to make sound decisions;
- the members have begun to sort through alternatives for addressing problems and meeting goals, and have discussed how they will measure their progress.

Who needs a watershed plan?

Some groups reach this point, but do not see a need for documenting their intentions in a written plan. They may feel that they know well enough what they are doing and do not need a written plan. They may view writing a watershed plan as a major task that will sap their resources, or they may simply not know where to start. If the project is very small and short-term, and if the group does not need outside resources to complete tasks, then perhaps a written plan is not needed. However, here are some important reasons for developing a written watershed plan:

- **To have a long-term, positive effect on water quality or other natural resources.** A written plan documents what the group knows about the watershed, records priorities and ideas, persons responsible for implementation, and provides a process for monitoring and evaluation. As new people join the group and partnership roles change, the written plan is a road map of direction and continuity.

- **To let the community know about the project.** A plan provides the group with a way of saying to the community, "This is who we are, why we are working together, what we have accomplished, and where we are going."
- **To obtain funding and support from local government, state & federal sources, or industry.** A plan provides the group with a marketing tool. It can be used to demonstrate that they are organized, committed, working well together, and have a partnership that represents many interests in the watershed. The plan also makes it easier and faster to prepare funding proposals and grant applications.
- **To track progress and celebrate success.** By establishing a monitoring and evaluation process, a plan makes it easier to measure progress toward the goals the group has established. By periodically reviewing the plan, the group can document their success and determine whether they have focused their resources effectively.
- **To expand and become more effective.** People want to know what they can do to improve the area where they live, and they want to be part of a success story. By clearly documenting problems and opportunities, and by proposing appropriate and practical solutions, a plan invites others in the community to participate in watershed projects. As the partnership grows, it becomes easier to implement the plan.

Remember, a plan is a road map, not the Encyclopedia Britannica

Whether you refer to your plan as an action plan, guide, blueprint, watershed user's manual, or whatever, you are essentially creating a road map telling how the group will get from here to there. A plan answers these four questions:

Where do we want to be?
Where are we now?
How are we going to get there?
How will we know when we have arrived?

You can put your plan together in any order that makes sense to you and clearly answers those questions for the reader. The size, level of detail, and technical complexity of the plan will depend on the characteristics of the watershed and what degree of change is needed to meet your goals. Be flexible: you may want to have a brief plan summary that will be used with the public, and an expanded technical plan that will lay out the necessary steps in enough detail to implement them. You may want to put your plan in a binder so additions and revisions can be made easily.

Every plan is unique to the community and to the watershed for which it is written. It is not the intention of this Guide to dictate any particular way of arranging or presenting a plan, or to stifle the creativity and enthusiasm of your group. There are, however, certain elements of a good and effective plan, and you should consider these as you put your plan together.

Elements of a watershed plan

Where do we want to go?

Vision and mission of the group
Measurable goals and targets
Executive summary of the plan

Where are we now?

Concerns of the community
Problem statements
Members of the group
History of the group
Structure of the group
Current condition of the watershed
Information gathered in the inventory

How are we going to get there?

Possible alternatives
Selected alternatives
Implementation or action plan (who, what, when, and how)
Resources (funding, manpower, and other needs)

How will we know when we've arrived?

Monitoring strategy
Indicators for goal targets
Schedule for evaluation

Essential details: Include a contact person(s) with phone number and address, a table of contents, a glossary of acronyms, sources for specific data, and maps of the watershed.

If your group has worked through the steps in the previous chapters, then a lot of the material listed above already exists, at least in your heads. ***It is especially important to 'corral' all the inventory material, records of decisions made by the group (minutes, meeting notes), and records of things the group has accomplished (tours, field trips, work sessions, et cetera.)*** It is helpful to set up a large three-ring binder with a tab for each of the elements listed above and insert material into it as the group reaches these stages of growth.

The group's decision-making body (steering committee, executive board, or other structure) can then designate a coordinator or small committee to write up the various parts of the plan, not necessarily all at once. When all of the elements have been completed, the plan is also complete.

A review period for the draft plan is critical. Send copies ***very clearly marked DRAFT*** to anyone who has had input to the plan, people whose support you will want later, and those who may have had misgivings about portions of the plan. Not only will you receive useful feedback, but you may also save yourself from having to eat crow at a later date.

If you want to have the plan printed rather than photocopied, see whether the county government, another agency, or your local school system will offer an inexpensive way to get copies printed. Fancy packaging is not as important as content, but the plan should appear neat and professional so it will be taken seriously.

We wrote it; now what do we do with it?

Once the plan is in some sort of coherent state and has been tidied up for public presentation, here are some of the things the group could do with it:

- **Each member needs a copy** for reference.
- **Send a copy to all the movers and shakers in your watershed:** county government officials, especially the planning commission, county commissioners, health department, water utilities, and drainage board; people in agencies who have the authority to delegate resources to your cause, interest groups, possible future sources of support, opponents, et cetera. ***An executive summary is handy for reducing copy costs and providing a readable document; those who want more detail can request the technical plan.*** A cover letter, or better yet a personal contact, should be included.
- **Prepare funding requests,** grant applications, coordinator job descriptions, et cetera from the material in the plan.
- **Put copies in local libraries,** schools, or wherever the plan may get some attention.
- **Hold a public meeting** to introduce the plan to the community and encourage participation in projects. Hopefully all interests in the community have been represented in the plan development; otherwise, you may suddenly face a lot of changes!
- **Put your plan on the Web** either through your own website, or by piggybacking on the website of a supporter such as the county government, conservation district, et cetera. This is an inexpensive way to get a lot of exposure. It also makes it easy to amend or add to the plan.
- **Implement the plan** and work toward your goals! The whole point is to do work in the watershed, not to produce a stack of paper.
- **Review your plan regularly,** and use it to develop specific action plans for projects. Don't hesitate to revise or update it as needed. Don't let it sit on a shelf!

What follows are two checklists used by some groups or agencies to develop plans or to review plans for funding. Remember that your plan needs to fit your watershed, so not all parts of either checklist may be applicable.

[Example I]

Checklist for Watershed Management Plans

(for plans developed with citizen involvement at the local level, addressing water quality concerns)

Watershed _____ Plan Date _____

Note: This checklist provides guidance to groups preparing watershed plans. It is not intended to be a template for any particular plan, and it is not a list of requirements. The checklist shows items that should be considered when preparing a plan; each plan is unique and must reflect the community and the watershed for which it is prepared.

	Component	✔	Comments
1. Introduction	Are mission/vision/goals/objectives clearly stated?	❑	
	Are problems and concerns in the watershed clearly identified, and sources of those problems clearly identified and described?	❑	
	Explain how and why the watershed group got together.	❑	
	Define group structure, who is in the group, and how the group operates.	❑	
	Why was a watershed plan developed?	❑	
	How did the public participate in the plan? (Include letters or other documentation for public participation in an appendix.)	❑	
	Is the planning boundary defined & shown on a map? Is there an inset to show where this watershed is in the state?	❑	
2. Determine objectives	Clearly state how objectives/goals were developed. Who was involved in determining goals and what was the process?	❑	
	Are objectives/goals realistic and appropriate?	❑	

3. Inventory resources	Explain how information was gathered, where the information came from, and how watershed resources were inventoried.	❑
	Is the information shown clearly with narratives, maps, tables, et cetera, that are easy to understand? Are "before," or benchmark conditions described?	❑
4. Analyze	Explain how the information was used to develop alternative solutions to problems in the watershed.	❑
	Explain how concerns in the watershed are prioritized.	❑
5. Formulate & evaluate	Explain what alternatives the group looked at for solving problems in the watershed.	❑
	Discuss ecological, social, economic, and other considerations for each alternative or group of alternatives.	❑
	Explain the effect of each alternative: cost, value to the environment, acceptability/ appropriateness in this watershed, et cetera.	❑
6. Make decisions	What decisions did the group make about addressing problems in the watershed? What was the decision-making process? Who was involved? Why were certain alternatives accepted or rejected?	❑
	What will the group do to carry out the plan? Set targets (example: "Reduce sediment delivery by 25% in 10 years"). Use indicators (water quality standards, biological indexes, et cetera) to show what will be measured to determine success.	❑
	Document current conditions (see #3) in order to set achievable targets.	❑
7. Implementing the plan	Develop an action plan stating what will be done, when it will happen and how long it will take, and who will be responsible for each action.	❑
	What resources are needed (manpower, money, et cetera)? Describe any funding, grants, sponsorship, or programs that will help meet goals.	❑
	Is there a partnership agreement with landowners? Are there any incentives?	❑
	How will the work be inspected and maintained?	❑

7. (cont'd) How does this plan fit in with other conservation work going on in the watershed? ❑

8. Monitor How will progress be monitored, both in practical terms of work done and in terms of changes in water quality? Who will be responsible? ❑

Describe how the watershed plan will be reevaluated based on the monitoring information? ❑

General Recommendations

In Your Plan, Consider Including These:

- Who (person or group) prepared the plan and who sponsored it (usually on the cover or inside cover).
- Contact person and phone number or at least an address.
- Brief calendar of when things happened, and when things are going to happen. The progression of events may be confusing to some readers who were not involved in the process.
- Glossary of terms that may be unfamiliar to readers.
- Brief description of the institutions, agencies, and groups involved in the planning effort.
- How and where the plan will be distributed, and how the plan may be used (example: to obtain funding).
- Use a format (binder, folder) that allows extra pages to be added or inserted as things progress.

Absolutely Essential?

- Proofread, proofreed, prufread—and then have a few other people proffread. Even your computer spell-checker can be fooled.
- Spell out all acronyms the first time they're used in the text—you don't know who will be reading the plan.
- In the text, define any terms that are technical or specialized (examples: HEL, "T", gradient, pH, WASCOB, et cetera).

Project Design Checklist for Nonpoint Source Water Quality Projects on a Watershed Basis

Following is a checklist of ideas and tactics gleaned from The National Rural Clean Water Program Symposium held September 13-17, 1992 in Orlando, Florida, and from other sources, that are keys to efficiently and successfully implementing any new federal, state or local water quality programs or projects on a watershed basis.

We encourage program managers to develop a project checklist by integrating their ideas with the following points.

In general, projects should

- ❑ Have a clearly stated goal, supported by a realistic assessment of the problem and the feasibility of solving it.
- ❑ Stress voluntary participation through education, technical assistance and incentives, and emphasize project benefits.
- ❑ Stress target audience involvement at project initiation.
- ❑ Target areas where realistic water quality benefits can be maintained and/or obtained. It should be recognized that because of forces of nature or the natural environment, some areas may not respond to water quality treatments.
- ❑ Concentrate on one-on-one education and demonstration programs.
- ❑ Have full funding for the project committed up front.
- ❑ Include necessary cost-share funds.
- ❑ Be long-term (>10 years) in order to understand causes of nonpoint source pollution and the effects Best Management Practices (BMPs) have on water quality.
- ❑ Have a clear understanding of BMPs already in place prior to the study.
- ❑ Have adequate pre-implementation assessment and monitoring.
- ❑ Evaluate all sources of potential pollutants that might override water quality improvements produced by individual BMP practices (for example, phosphorus loading and cycling from existing lake bottom sediments, existing soil-nutrient concentrations, erosion from stream banks, point sources, and non-agricultural nonpoint sources.) If necessary, take additional measurements to demonstrate that BMPs are producing water quality improvements that will succeed in the long-term.
- ❑ Evaluate land uses in detail for each year for all land within the project, regardless of participation. (Actual water quality improvements produced by a majority of the farmers upstream can be underestimated because of impacts of a few non-participating landowners preceding the monitoring station.)
- ❑ Have a written, agreed-upon plan (protocol) and time lines.
- ❑ Have sufficient funding to accomplish scientific assessment and evaluation, which should include measurements such as long-term, continuous-flow discharge records and flow proportional sampling. (This may require anywhere from 10-50% of the budget.)
- ❑ Have a separate, independent group of recognized experts/professionals overseeing design and implementation of monitoring and analysis procedures, and evaluation of data.
- ❑ Measure participating and non-participating landowners' and other interested groups' attitudes and perception both pre- and post-project.

Local project teams should:

❑ Implement processes for getting people to work together. One of the best processes involves five crucial steps that should be taken in the following order:

Step #1. At the first meeting develop a written statement of the group's beliefs that are relevant to the project.
Step #2. Determine the wants and needs of group members that are relative to the issue and prioritize them.
Step #3. Develop and agree on obtainable, measurable written objectives for priority wants and needs.
Step #4. Develop a plan of implementation for the most significant objectives, including a) necessary resources of persons, finances, equipment, time and space, and b) appropriate techniques (committees, meetings, training sessions, newsletters, tours, demonstration projects, et cetera).
Step #5. Periodically evaluate the group's performance against the plan of implementation and make adjustments to the plan or to the written beliefs, if necessary.

Step #1 is the most crucial part of working together on any local project. It must be done first to ensure an efficient and successful project—too often people want to jump right to step #4 and ignore the first three steps.

❑ Recognize existing accomplishments of farmers and ranchers. Don't incriminate; instead, say "Let's build and do better."

❑ Develop and agree upon, at the start of the project, a written set of limitations about what the project can't do.

❑ Staff for adequate one-on-one educational and technical assistance with landowners who choose to change practices. Project organizers also should work closely with Extension Service and Vo-Ag instructors.

❑ Tailor BMPs to the local situation or objective.

❑ Make producers aware, up front, of both the positive and negative economic potentials of every BMP. Positive economic benefits, coupled with environmental effectiveness, are very powerful motivational forces.

❑ Use small watersheds (no bigger than the size of the county, and preferably smaller.)

❑ Be an inter-agency and inter-disciplinary effort.

❑ Include a local coordinating committee of no more than seven to eleven members. Landowners should compose at least one-third to one-half of the committee.

❑ Have core project staff designated from participating agencies.

❑ Have a project coordinator who is retained for the life of the project.

❑ Agree upon a system of regular two-way communication between the Local Coordinating Committee and the State Coordinating Committee.

❑ Establish, in advance, estimates of the necessary quality of data recorded to demonstrate impact of BMPs.

❑ Involve the secretarial staff of all participating agencies. They should meet with project leaders near the start of the project to help develop key reporting forms that will be used to document project progress and results.

Chapter Seven

Implementing and Evaluating Your Watershed Plan

FOCUS

- Developing an action strategy
- The role of a watershed coordinator
- Sources of funding
- Evaluating your progress

Goals set, information gathered, technical agencies on board, decisions made, plan drafted—now what?

Implementation is the ***how we're going to get there*** phase. The implementation section of a watershed plan lays out, in sufficient detail for general understanding, the who, what, how, and when of all the tasks that will get the group to its goals. To carry out each task, an ***action strategy*** is needed.

Having an action strategy

1. Increases the likelihood that the solution will be implemented effectively and on time.
2. Prevents the group from underestimating the time and resources needed to get a task done.
3. Prevents people being 'volunteered' for work without checking with them first.
4. Shows when complex tasks need to be broken down into parts.

Developing an action strategy

An action plan lays out each task, date to be completed, resulting products, resources needed, and responsible persons. While the group may find that documenting these details is tiresome and less exciting than going out and doing something, an action strategy is critical for all but the simplest projects.

You can use any format you are comfortable with; a common approach is to develop a table similar to the one that follows:

Action plans may be included in the watershed plan, or may be for internal use.

Task: Hold a nutrient-management workshop for agricultural producers on January 10th.

Steps	Why this step?	Start date	Completion date	Resources needed	Who is responsible?	Checkpoints	Results
Determine location	to provide a good facility	10/1	12/1	room rental fee, overhead screen, flipchart	Joe	October & November meetings	Room reserved
Provide mailing list	to reach all landowners	9/15	12/1	computer at SWCD office, postage	Tom		Mailings sent to landowners
Arrange for speakers	to get information across	9/15	12/1	reimburse speakers for lunches and mileage	Marie & Jeff		Speakers have agreed to come

. . . and so on, to include publicity, getting enough chairs, exhibitor booths, coffee and donuts, commercial sponsors, reproducing handouts, et cetera.

Checkpoints

Every action strategy should include the points at which the people carrying out the tasks need to report back to the main group. This is especially important if subcommittees have been set up for education, public relations, technical assistance, and other group functions. Each checkpoint should state the ***date*** (or stage in the action) when the report should be made, the ***products*** that need to be complete at that time (such as completed mailing lists, lists of potential sponsors, draft newsletter, or whatever), and ***who*** is responsible for checking in with the main group.

Checkpoints prevent overlaps in effort and misunderstandings about what is supposed to be happening. They provide an opportunity for modifying the action strategy if necessary. They also might show when the subcommittee can ask for additional help or resources, let the main group know about progress, or solicit ideas on dealing with barriers they may have encountered. ***Having definite checkpoints set up in advance makes it easy to get these items on the meeting agenda so they don't get glossed over or forgotten.***

Should you hire a coordinator?

Since a watershed group is made up of volunteers, the group may want to consider hiring a coordinator at some point. It can be tough to get the phone calling, letter writing, personal contacts, grant writing, plan development, task tracking, et cetera done in somebody's spare time. A coordinator can

- attend to necessary details;
- organize events;
- pull together water monitoring efforts;
- attend other meetings useful to the group and report back;
- act as librarian for inventory data, minutes, correspondence, and mailing lists;
- pull together and write up parts of the watershed plan;
- present the group's plans to others; and
- coordinate additional functions based on the needs of your watershed.

Funding for a coordinator could come from a grant or contract, or through a local organization that is supported by the county government (such as the SWCD), or through job-sharing or internship. The first

step in hiring a coordinator should be to draw up a detailed list of duties and expectations, so you are clear about the qualifications you are looking for. Contact other groups that have a coordinator and ask for job descriptions, copies of contracts, and what they would have done differently. It is also helpful to talk to other currently employed coordinators. *(There is a list of watershed project contacts in Chapter Four.)*

Submitted by a real, live coordinator:

"A watershed coordinator can wear many hats: fund-raiser, cheerleader, coach, educator and more. The following duties are an example of the work done by a coordinator of one project in Indiana. Your project may take a different approach; however, many of the listed duties are crucial to the success of any watershed project.

'The Watershed Coordinator shall . . .'

- Provide staff leadership to the steering committee of the watershed project. Guide them in problem identification, plan development, and implementation. Assist the steering committee team-building. Educate the steering committee, as needed, on various topics through personal knowledge, qualified people, articles, maps, or other materials.
- Assist the steering committee in building the watershed partnership. Gather support from businesses, organizations, and government agencies.
- Provide leadership and guidance to the steering committee in the development of a watershed management plan and in the implementation of the plan.
- Assist subcommittees, as needed, with determining problems within the watershed and assist with recommendations regarding solutions to specific problems. Act as a facilitator when needed. Communicate the needs/actions of the steering committee to subcommittees and vice versa.
- Work with the sponsors, interested local organizations, and representatives of other federal and state agencies to determine and coordinate data required to further the project.
- Work closely with the staffs of governmental agencies that have ties or need ties to the project. Promote "water quality" programs.
- Obtain necessary materials, technical information and services needed to keep the project plan current.
- Assist the steering committee and sponsors in designing and carrying out an effective information and education program within the watershed to meet the needs of diverse audiences with tailored activities on a regular basis. Inform the general public of the project goals and activities on a continuing basis through newspaper articles, radio, newsletters, television and other personal appearances. Maintain working relationships with all the news media within the watershed. Keep everyone involved up-to-date! Remind them of their importance to the entire project.
- Coordinate activities such as school programs, campaigns, field days, tours, workshops, pilot projects, and any other public activities.
- Assist the steering committee with pursuing funding opportunities and writing grant proposals.
- Keep abreast of current developments and new programs that may further assist the project; relay significant information and data to partners involved in the project.
- Prepare special reports as needed.
- Keep the watershed community and its partners informed via telephone calls, meeting minutes, personal visits or memos.

In short, the coordinator is the glue that connects the many different parts of a watershed project. Often he or she is the only staff person working with a group of volunteers. When you see a watershed coordinator, you should see a motivator!"

Funding, programs and grants

When the group has a clear idea where it is going and how it wants to get there, look for a source of support for the projects to be implemented. Consider existing programs that the group can promote to meet its goals. For instance, the group could publicize and encourage landowners to participate in the Conservation Reserve Program (CRP). Some support comes through programs that establish priority areas in which to focus funds, such as IDNR's Lake & River Enhancement program, or the Conservation Priority Areas designated each year for the NRCS Environmental Quality Incentive Program (EQIP). Some support will come through grants for specific purposes.

It is best not to seek money in the early stages while the group is still forming. It can work against a group to get grant or program funds before it is ready to spend them intelligently. When focused on getting a grant, the group sometimes loses sight of easier and better ways to get things done right in its own back yard. Also, until the group has developed at least the skeleton of a plan, it may request money for something and find out that when the contract is awarded, it really wants to do something else. ***The worst possible time to plan is after the money shows up!***

The following list of support sources is not all inclusive, but provides plenty of places to start. Phone numbers are in the Appendix B: Contacts.

Funding sources for watershed projects

Federal Conservation and Watershed Projects

EPA

Section 319, 604(b), and 104(b)3 Grants

Grants for conservation practices, water body assessment, watershed planning, and watershed projects. Available to non-profit or governmental entities. These monies, enabled by the Clean Water Act, are funneled through the Indiana Department of Environmental Management. ***See IDEM for details.***

EPA GREAT LAKES

Numerous sources of funding are available for the area that drains into the Great Lakes. The complete grants guidance and application package for EPA Great Lakes grants is on the web, and additional funding sources are at the Great Lakes Information Network (http://www.great-lakes.net) Grants are submitted in early spring for most of these sources.

USDA ***(See county listings for local federal agency contacts.)***

EQIP: Environmental Quality Incentive Program. Administered by the Natural Resources Conservation Service. Conservation cost-share program for implementing Best Management Practices, available to agricultural producers who agree to implement a whole-farm plan that addresses major resource concerns. Up to $50,000 over a 5 to 10 year period. Some parts of the state are designated Conservation Priority Areas and receive a larger funding allotment.

WRP: Wetland Reserve Program. Administered by the Natural Resources Conservation Service. Easement and restoration program to restore agricultural production land to wetland. Easements may be for 10 years, 30 years, or permanent. Longer easements are preferred. Partnerships with other acquisition programs are encouraged. Restoration and legal costs are paid by NRCS. Landowner retains ownership of the property and may use the land in ways that do not interfere with wetland function and habitat, such as hunting, recreational development, and timber harvesting.

CRP: Conservation Reserve Program. Administered by the Farm Service Agency with technical assistance from NRCS. Conservation easements in certain critical areas on private property. Agricultural producers are eligible. Easements are for 10 or 15 years, depending on vegetative cover, and compensation payments are made annually to replace income lost through not farming the land. Cost share is available for planting vegetative cover on restored areas.

WHIP: Wildlife Habitat Incentive Program. Administered by the Natural Resources Conservation Service. Cost share to restore habitat on previously farmed land. Private landowners who are agricultural producers are eligible. Cost share up to 75%, and contracts are for 10 years.

FIP: Forestry Incentive Program. Administered by the Natural Resources Conservation Service. Cost-share to assist forest management on private lands. Funds may be limited.

US Fish & Wildlife Service

Partners for Wildlife: assistance for habitat restoration.

State Conservation and Watershed Programs

IDNR Division of Soil Conservation

L&RE: The Lake & River Enhancement Program funds diagnostic and feasibility studies in selected watersheds and cost-share programs through local Soil & Water Conservation Districts. Project oversight provided through county-based Resource Specialists and Lake & River Enhancement Watershed Coordinators. Funding requests for Watershed Land Treatment projects must come from Soil & Water Conservation Districts. If a proposed project area includes more than one district, the affected SWCDs should work together to develop an implementation plan. The SWCDs should then apply for the funding necessary to administer the watershed project.

Before applying for funding, the SWCDs should contact the Lake & River Enhancement Coordinators to determine (1) the appropriate watershed to include in the project, (2) whether the proposed project meets the eligibility criteria, and (3) whether funding is available.

IDNR Division of Fish & Wildlife

Classified Wildlife Habitat Program: Incentive program to foster private wildlife habitat management through tax reduction and technical assistance. Landowners need 15 or more acres of habitat to be eligible. IDNR provides management plans and assistance through District Wildlife Managers. (See county listings.)

Wildlife Habitat Cost-share Program: Similar to above.

IDNR Division of Forestry

Classified Forest Program: Incentive program to foster private forest management through tax reduction and technical assistance. Landowners need 10 or more acres of woods to be eligible. IDNR provides management plans and assistance through District Foresters. (See county listings.)

Classified Windbreak Act: establishment of windbreaks at least 450 feet long adjacent to tillable land. Provides tax incentive, technical assistance through IDNR District Foresters.

Forest Stewardship Program & Stewardship Incentives Program: Cost share and technical assistance to encourage responsibly managed and productive private forests.

IDNR Division of Reclamation

Appalachian Clean Streams Initiative: Funds for acid mine drainage abatement.

IDNR Division of Nature Preserves

State Nature Preserve Dedication: acquisition and management of threatened habitat.

IDEM Office of Water Management

State Revolving Fund: available to municipalities and counties for facilities development. Will be available in 1999 for nonpoint source projects as well. Funding is through very low-interest loans.

Section 319 Grants: available to nonprofit groups, municipalities, counties, and institutions for implementing water quality improvement projects that address nonpoint source pollution concerns. Twenty-five Contacts percent match is required, which may be cash or in-kind. Maximum grant amount is $112,500. Projects are allowed two years for completion. Projects may be for land treatment through implementing Best Management Practices, for education, or for developing tools and applications for state-wide use.

Section 205(j) Grants, formerly called 604(b) Grants: available to municipalities, counties, conservation districts, and drainage districts. These are for water quality management projects such as studies of nonpoint pollution impacts, nonagricultural NPS mapping, and watershed management projects targeted to Northwest Indiana (including BMPs, wetland restoration, et cetera.)

Section 104(b)(3) Grants: These are watershed project grants for innovative demonstration projects to promote statewide watershed approaches for permitted discharges, development of stormwater management plans by small municipalities, projects involving a watershed approach to municipal separate sewer systems, and projects that directly promote community based environmental protection. NOTE: The deadline for IDEM'S grants programs is annually, by March 31st.

Private Funding Sources

National Fish and Wildlife Foundation.

1120 Connecticut Avenue NW, Suite 900, Washington DC 20036. Nonprofit, established by Congress in 1984, awards challenge grants for natural resource conservation. Federally appropriated funds are used to match private sector funds. The six program areas are wetland conservation, conservation education, fisheries, migratory bird conservation, conservation policy, and wildlife habitat.

Utilities (check local utilities such as IPALCO, CINergy, REMC, NIPSCO.
Many have grants for educational and environmental purposes.)

Indiana Hardwood Lumbermen's Association

Indiana Tree Farm Program

The Nature Conservancy

Land acquisition and restoration.

Southern Lake Michigan Conservation Initiative
Blue River Focus Area
Fish Creek Focus Area
Natural Areas Registry
Hoosier Landscapes Capitol Campaign

Conservation Technology Information Center (CTIC)

Know Your Watershed educational materials are available

Indiana Heritage Trust

Land acquisition programs

Ducks Unlimited

Land acquisition and habitat restoration assistance

Sycamore Land Trust
Acres Inc. (land trust)
Oxbow, Inc. (land trust)

Sources of additional funding opportunities

Catalog of Federal Funding Sources for Watershed Protection
EPA Office of Water (EPA841-B-97-008) September 1997

GrantsWeb: www.srainternational.org/cws/sra/resource.htm

How are we doing?

Using indicators to evaluate your progress

One of the most important things the group will do is evaluate whether the plan is actually making a difference. Many plans don't even mention evaluation, yet without some conscious process, how will you know whether you have met your goals?

Early on, when the group was discussing measurable goals and thinking about developing a water monitoring program, someone may have mentioned ***indicators***. These are things in the environment or community that you can measureand that indicate whether things have gotten better or worse and by how much. Indicators fall roughly into two categories—administrative and environmental.

Administrative indicators are beans that you can count: the number of permits issued, the number of grassed waterways installed, the number of acres converted to no-till corn, the number of cans collected at a recycling center, and so on. They are usually easy numbers to come up with, but they are often indirect indicators of what you really want to know. Counting the number of feet of grassed waterway is a useful measure of work done, but it will not tell you whether the amount of sediment entering the stream has actually decreased.

Environmental indicators are measurements of water quality, habitat, or some other criterion that tells you something about the health of the environment. They include such things as the amount of phosphorus or nitrogen in the water, macroinvertebrate population diversity, the growth of algae in lakes, the turbidity of the water, occurrences of certain species, or the mercury content in fish tissue. These indicators require more time, resources, and planning than do administrative indicators, but they usually are better ways to evaluate progress. When a group is developing goals, it can plan ahead for what indicators will need to be measured to track progress for each goal.

Technical assistance agencies can help the group choose and measure indicators. The group may also be able to piggyback on the efforts of certain agencies that are already gathering environmental or administrative data for other purposes. The following are some further examples of indicators:

Examples of Indicators

Indicator Type	Indicators
These document the extent to which program or regulatory actions have been taken.	Number of permits reissued with new limits Number of point sources in substantial noncompliance Elapsed time from identification of permit violations to correction Amount of fertilizer sold or used Number of communities enacting strom water ordinances Number of public water systems with source water protection plans Number of citizens reached with public education efforts
These quantify the extent to which actions have led to reduction in threats to surface or groundwater quality.	Reduction in nutrient loadings from each type of point and nonpoint source Stability and condition of riparian vegetation Percent impervious surface upstream General erosion rate upstream Amount of toxics discharged by spills Number of businesses and households that have altered behaviors or processes to reduce pollutants
These measure the extent to which water quality has changed.	Pollutant concentrations in the water columns, sediments, and goundwater Frequency of restrictions on water uses (bathing, drinking) Percent of stream miles that support each designated use Percent with impaired or threatened uses Percent of citizens who rate major water bodies as usable for various recreational activities
These measure direct effects on the health of humans, fish, other wildlife, habitat, economy, et cetera	Aquatic community indexes Reduction in waterborne disease in humans Size of wetlands or riparian habitat acres Size of recreational and commercial fish habitat Increased jobs and income due to recreation

Review your plan regularly

Agree on a regular time, perhaps quarterly, when the group will pull out the watershed plan, blow off the dust, and review what it says. Watershed plans should be living documents that can be changed or added to as needed. After all, you wrote it! You have the right to scribble in the margins, add new pages, and cross things out.

When the group accomplishes some piece of the plan, celebrate and let the community know about it. Recognize the people who helped.

Plan to revise the plan; plans are often written with a certain time frame in mind. Three to five years seems to be as much of our lives as we want to envision being tied up in a project. State at the end of the watershed plan when it will be revised or considered finished. This lets the community and the members know what to expect.

Chapter Eight

Watersheds 101: Useful Things to Know About Your Water Resources

FOCUS

- Hydrologic Unit Codes
- Water Quality Monitoring
- Geographic Information Systems

A watershed is all of the landscape that drains into a particular lake or river. Depending on the scale of the discussion, you could refer to the watershed of the Mississippi River, or the watershed of a farm pond. There are hierarchies that use terms such as drainage basin and river basin to mean specific hydrologic configurations. However, you may hear them used interchangeably with "watershed."

Hydrologic Unit Codes: the watershed address

Hydrologic unit codes were developed by the US Geological Survey (USGS) in cooperation with the US Water Resource Council. The USDA Natural Resources Conservation Service has incorporated this coding into its conservation planning practices. Most state agencies also use this coding system. The advantages are as follows:

- The hydrologic code attached to a specific watershed is unique.
- This code provides a common language for different organizations and agencies to use. If a code has been assigned, then there is agreement as to the boundaries of the watershed.
- Having watersheds delineated on published maps assists the public in understanding how landscapes function, where water quality problems may be addressed, and who needs to be involved in the planning process.

Example: ..... An example of a fourteen-digit hydrologic unit code would be 05120201-010-001. Each number or group of numbers in the code represents a specific landscape area.

Region	Subregion	Accounting Region	Cataloging Unit	Cataloging Subunit	Subdivision of Subunit
05	12	02	01	010	001

Numbering of watersheds is consecutive from upstream to downstream. The first two digits indicate the main river basin. The third digit may indicate all or a portion of that basin. In this way the third digit can be changed to designate, for example, two parts of a watershed on either side of a state line. ***The longer the HUC number, the smaller the watershed***.

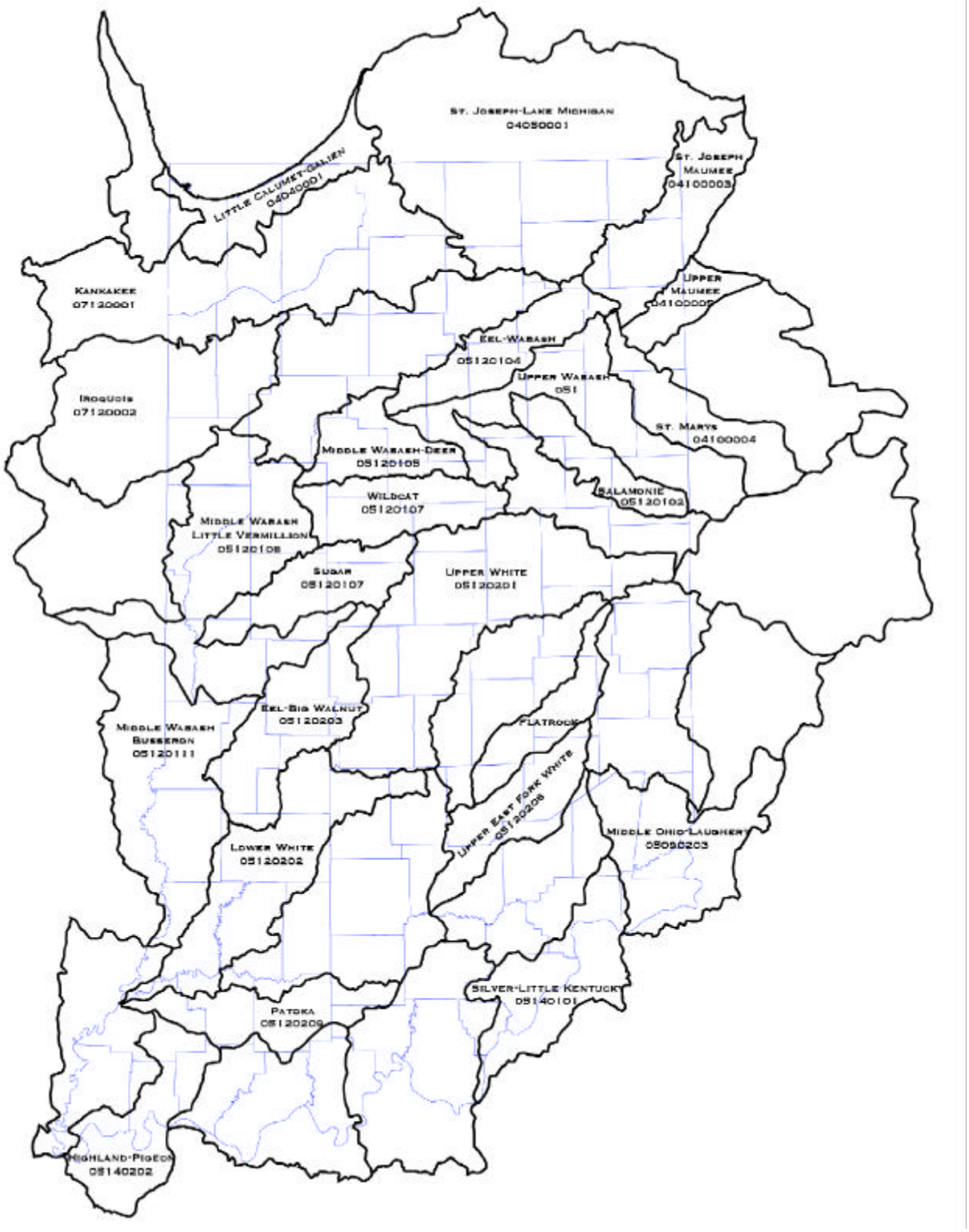
It is important to remember that **watersheds refer to surface water only**. Groundwater, which also is a drinking water source, is influenced by surface water but occurs in aquifers, not watersheds. The aquifers of Indiana have been mapped in the ***Indiana Groundwater Atlas*** (USGS). They have also been grouped in common hydrogeologic settings according to geology, vulnerability, et cetera (Maps & CD-ROM distributed by Office of the Indiana State Chemist). When addressing water quality issues, both ground and surface water should be considered.

Table 1 lists the Hydrologic Units in Indiana, along with the watershed names that have been assigned by the USGS.

The entire country has been mapped at the eight-digit hydrologic unit code level (about 2,211 watersheds). Indiana is divided into 39 eight-digit watersheds (see map, facing page). The U.S. Geological Survey, working with the Natural Resources Conservation Service, has further mapped Indiana's watersheds at the 14-digit level. These smaller watersheds average about 9,000 acres. The 14-digit maps are available from USGS and also on the USGS website.

For general information on your watershed, visit the U.S. Environmental Protection Agency internet site called ***Surf Your Watershed*** at www.epa.gov/surf/. Also check out IDEM's website at www.state.in.us/idem/owm for information on impaired waters.

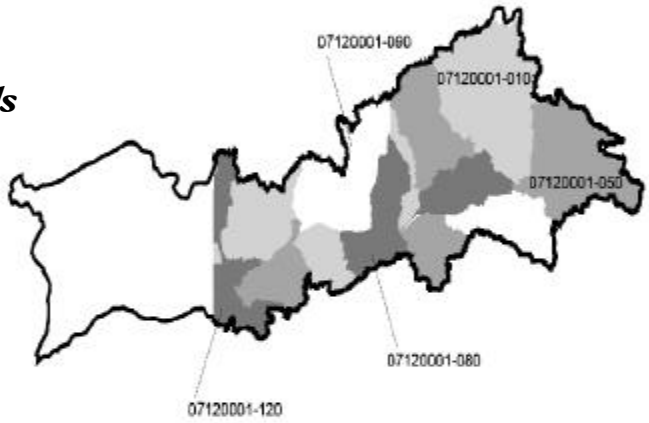
8 Digit Watersheds



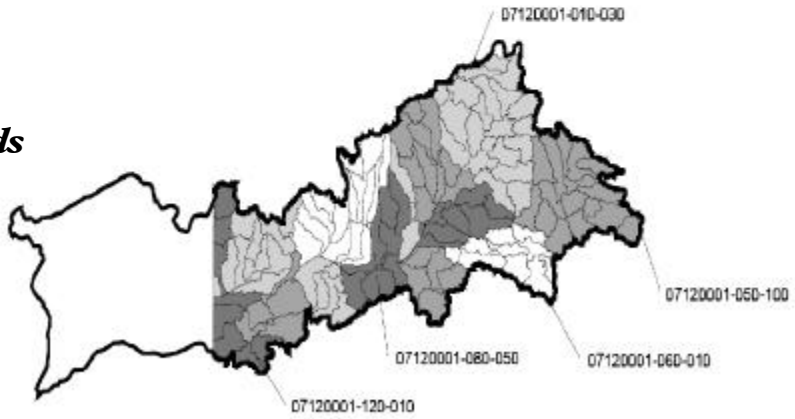
Source: IDEM, Office of Water Management, 1998

8 Digit Watershed

11 Digit Watersheds



14 Digit Watersheds



Source: IDEM, Office of Water Management, 1998

Table 1. Hydrologic Unit Codes, Indiana, 8-digit

HUC	River	Counties
04040001	Little Calumet-Galien	Lake, Porter, LaPorte
04050001	St. Joseph	St Joseph, Elkhart, Lagrange, Stueben, Kosciusko, Noble, Dekalb
04100003	St. Joe	Steuben, Dekalb, Noble, Allen
04100004	St. Mary's	Allen, Wells, Adams
04100005	Upper Maumee	Allen, Dekalb
04100007	Auglaize	Allen, Adams
05080001	Upper Great Miami	Union, Franklin
05080003	Whitewater	Randolph, Wayne, Henry, Franklin, Fayette, Union, Rush, Decatur, Ripley, Dearborn
05090203	Middle Ohio-Laughery	Decatur, Franklin, Ripley, Dearborn, Switzerland
05120101	Upper Wabash	Grant, Howard, Miami, Cass, Adams, Wabash, Huntingtin, Whitley, Allen, Wells, Jay
05120102	Salamonie	Wabash, Huntington, Grant, Wells, Blackford, Jay
05120103	Mississinewa	Miami, Wabash, Grant, Madison, Blackford, Delaware, Jay, Randolph
05120104	Eel (Upper)	Noble, Whitley, Allen, Kosciusko, Wabash, Miami, Fulton, Cass
05120105	Middle Wabash-Deer	Cass, White, Carroll, Howard, Miami, Tippecanoe
05120106	Tippecanoe	Noble, Whitley, Kosciusko, Marshall, Fulton, Miami, Cass, Starke, Pulaski, Jasper, White, Carroll, Tippecanoe, Benton
05120107	Wildcat	Tippecanoe, Carroll, Clinton, Howard, Tipton, Grant, Madison
05120108	Middle Wabash-Little Vermillion	Benton, White, Warren, Tippecanoe, Fountain, Vermillion, Montgomery, Parke
05120109	Vermillion	Benton, Warren, Vermillion
05120109	Sugar	Fountain, Parke, Montgomery, Boone, Clinton

HUC	River	Counties
05120111	Middle Wabash-Busseron	Vermilion, Vigo, Clay, Sullivan, Greene, Knox
05120112	Embarras	Illinois, Border
05120113	Lower Wabash	Knox, Gibson, Vanderburgh, Posey
05120201	Upper White	Owen, Morgan, Johnson, Hendricks, Marion, Hancock, Boone, Hamilton, Tipton, Madison, Delaware, Randolph, Henry
05120202	Lower White	Gibson, Knox, Pike, Daviess, Sullivan, Greene, Martin, Owen, Monroe, Brown
05120203	Eel (Lower)	Greene, Owen, Vigo, Clay, Putnam, Morgan, Hendricks, Boone
05120204	Driftwood	Bartholomew, Brown, Johnson, Shelby, Marion, Hancock, Rush, Madison, Henry
05120205	Flatrock-Haw	Bartholomew, Shelby, Rush, Decatur, Fayette, Henry
05120206	Upper East White Fork	Jackson, Brown, Bartholomew, Jennings, Decatur, Shelby, Rush
05120207	Muscatatuck	Washington, Jackson, Scott, Clark, Jennings, Jefferson, Ripley, Decatur
05120208	Lower East White Fork	Pike, Daviess, Dubois, Martin, Orange, Greene, Lawrence, Washington, Monroe, Brown, Jackson, Batholomew
05120209	Patoka	Gibson, Pike, Dubois, Spencer, Perry, Crawford
05140101	Silver-Little Kentucky	Harrison, Flyod, Clark, Scott, Jefferson, Ripley, Switzerland
05140104	Blue-Sinking	Perry, Crawford, Harrison, Floyd, Orange, Washington
05140104	Lower Ohio- Little Pigeon	Vanderburgh, Warrick, Pike, Dubois, Spencer, Perry, Crawford
05140202	Highland Pigeon	Posey, Vanderburgh, Warrick, Gibson
07120001	Kankakee	Lake, Newton, Porter, Jasper, Laporte, Starke, Pulaski, St Joseph, Marshall, Elkhart, Kosciusko
07120002	Iroquois	Lake, Newton, Jasper, Pulaski, White, Benton
04060200	Lake Michigan	----

Geographic Information Systems (GIS)

What is a GIS? A geographic information system is a computer-based tool for mapping and analyzing things that exist and events that occur. GIS technology integrates common database operations such as statistical analysis and queries with the unique visual benefits offered by maps. A GIS works by storing information about the world as a collection of thematic layers that can be linked together by geography. Each bit of information contains either a geographic reference such as latitude and longitude, or an implied reference such as an address, zip code, census tract, or road name. These references allow you to locate features such as forest stands, and events such as earthquakes, on the earth's surface.

Vector & Raster. GIS works with two fundamentally different types of geographic models, the "vector model" and the "raster model." In vector, information is stored as a series of x/y coordinates or points. The location of a point feature such as a gas well can be described by a single set of coordinates; a river would be a collection of points. Areas such as watersheds or sales territories can be stored as a closed loop of coordinates. This method is useful for mapping discrete features but is not much use for continuously varying features such as soil type. The raster model is made up of a collection of cells in a grid, like a scanned picture made up of pixels or a paint-by-number picture. A GIS system can handle both models.

What does a GIS do?

Input: data has to be converted into a digital format before being used in a GIS, so the system 'knows" where everything is. Many types of data already exist in GIS-compatible formats, and can be loaded directly into a system. Other data has to be digitized, which may be time-consuming.

Manipulation: Data types need to be manipulated to be compatible, for instance, so that they are all at the same map scale and can be layered on top of each other (roads, rivers, and population on a base map of land use, for example.) Manipulation tools are built into currently available systems.

Data Management: For small projects, data may simply be stored as files. For large projects, a database management system is needed.

What can you do with a GIS?

Ask questions! In fact, learning to frame your questions correctly is key to getting the most from a GIS. You can ask simple questions like, "Where do the people live and work in my watershed?" or complex analytical questions like, "If we build a new highway here, how will the community be affected?" Two important tools of a GIS are proximity analysis (How many houses are within 500 feet of this stream and where are they?) and overlay analysis (Show me all the soils, slope, vegetation, and land ownership). Most GIS reports are maps, sometimes with tables attached.

Related technology: GPS, or global positioning systems, measure specific locations on the earth's surface using satellite signals and are available as hand-held units. The signals can be transposed into map positions in the GIS. GPS units are commonly used for surveying, navigation, and locating features such as dams, pipe outfalls, et cetera.

What GIS is NOT: GIS is not a decision-making system. It is a tool that supplies information in a form that may make it easier for a group to arrive at decisions, but it can also be confusing if the questions are not framed well. It is also only as good as the information that is fed into it! GIS is also not absolutely

essential to watershed planning. A great deal of information can be presented on ordinary paper maps and transparent overlays for much less than the cost of a GIS system and the training required to operate one. It is a wonderful tool if the money and manpower are available. Consider partnering with another group, agency, local government, or university to gain access to a GIS for your watershed planning process.

Commonly available GIS products: ArcView is available from ESRI (a commercial company). It allows viewing of spatial data, compiling of layers into maps, primarily used with readily available databases.

ArcInfo is available from ESRI. It allows complex data analysis, suited to manipulating large volumes of data.

For more information, check out your local community college and the library, look at ESRI's website, and talk to county planning officials. If they do not presently have a GIS, they probably have researched purchasing one and have recent information.

A short course on water & water quality monitoring

This section is courtesy of Dr. Gwen White, IDNR

Volunteer water quality monitoring provides many cost-effective benefits to the participants and the watershed community. Volunteers who are trained in monitoring are well prepared to educate themselves and local communities about the connection between their actions and the future quality of life in the watersheds. Adults and students in school classes or clubs can acquire the interdisciplinary skills in chemistry, biology, physics, and public policy that are required for making effective decisions regarding resource management.

Brief history of water quality monitoring

Public policy balances short-term individual benefits against quality of life for neighbors and future generations. The national water quality goals first articulated in the Clean Water Act in 1972 include "fishable and swimmable" waters; elimination of polluting discharges; and protection of public water supplies, aquatic life, and recreational activities. The term "fishable and swimmable" indicates a goal of maintaining or restoring potential water uses and reflects a long European history of recognizing the rights of the public to have resources available to fish, hunt, and use water for drinking and crops. Monitoring is mandated at the state agency level by the Clean Water Act, which requires all states to report to Congress every two years on progress toward water quality goals.

Since the Clean Water Act was enacted in 1972, the understanding of water pollution sources and focus of water quality monitoring has expanded. The original act reflected the urgency of dealing with severe problems caused by point-source pollution, including discharges from industries, sewage treatment plants, and other commercial facilities. The exact source was relatively easy to identify and measure as a discharge from "the end of a pipe." The first substantial case regarding water quality issues and the Endangered Species Act occurred in 1978 when the Supreme Court halted construction on the Tellico Dam because the dam would threaten an endangered species of fish known as the snail darter. Less than 10 years later, the Clean Water Act was amended to address non-point sources of pollution through Section 319, which requires states to identify water bodies where control of nonpoint source pollutants is necessary to meet

water quality standards and to establish management programs for listed waters. Funding from the US Environmental Protection Agency is channeled through the Indiana Department of Environmental Management (IDEM) to address issues related to Section 319. ***Projects receiving funding through this program are required to have a monitoring component.***

The most recent shift in water quality issues has been the recognition that habitat changes impair water quality as much or more than direct chemical and physical changes. The original Clean Water Act included provisions to address discharge of dredged or fill material in "waters of the United States" in Section 404. However, the extent of this jurisdiction was not clear until 1985 when the Supreme Court concluded that the Army Corps of Engineers had broad jurisdiction over any area flooded or saturated enough to support wetland plant and animal life. A number of uses either were exempted from jurisdiction or covered under broad general permits. Continued discussion of these actions has resulted in a debate regarding private property rights and public benefits.

Monitoring land-use effects on water quality has paralleled the shifting focus on problems reflected in the law. Most monitoring initially was conducted around point sources of pollution and measured chemical and physical characteristics. During the 1980s, several scientists recognized developed methods for using plant and animal communities to indicate the water quality for human use and to sustain ecosystems. W. L. Hilsenhoff developed one of the first systematic methods for use with aquatic macroinvertebrates (e.g., insects, leeches, snails) in 1982. James Karr developed a method for fish in 1986. Building on these methods, state agencies, including IDEM, have begun monitoring the quality of aquatic plant and animal communities, as well as conducting habitat assessments, in watersheds across Indiana. However, as of 1998, state water quality standards have not been set for the quality of habitat or plant and animal communities.

Volunteer monitoring can . . .

. . . expand information available through state monitoring programs.

The more data available to a watershed group, the better the group will understand and prioritize problems and potential solutions. States are required to submit regular reports to Congress on water quality. These are called "305(b)" reports in reference to the section of the Clean Water Act that provides the requirement. However, due to several limiting factors, information may not be available from state or federal agencies at locations in the watershed that are critical to project success. Physical or political access to some sites on private land may be limited to state agency personnel. Volunteers working in a watershed can obtain data for discrete use at the local level. Volunteers should always acquire permission from adjacent landowners prior to collecting information.

. . . stretch funding for watershed monitoring.

State-funded projects will include limited monitoring at the beginning and ending of projects. Collecting information on baseline and long-term trends in water quality can be expensive and time consuming, but it is essential for making appropriate decisions about watershed management. Limitations in funding may reduce the number of samples over space and time. Repeated monitoring can be used to distinguish between natural variability and changes caused by humans.

Consultant fees for monitoring can consume a significant proportion of project funding. Volunteer data will give supplemental information in years when funding for professional monitoring is not available. Volunteers increase the amount of information that can be collected with limited funding and target further professional monitoring to the most cost-effective areas. By matching volunteer monitoring with professional

monitoring at the same or nearby sampling sites, data from volunteers can be confirmed by professional monitoring. Results of the additional sampling by volunteers can be compared to periodic professional monitoring for calibration and validation.

. . . provide data needed to identify and prioritize need for restoration in the watershed.

Many state and federal programs depend on local groups to request funding for projects that would improve water quality. Local agencies and volunteers can identify the need for projects by acquiring information on the current status of local waters. Effective watershed management depends on identifying the sources of problems and the success of implemented solutions. Volunteer monitoring can provide information on project success that may be needed for continued support and to determine when existing methods are no longer functional or appropriate under a watershed's particular conditions.

. . . provide important information in determining impacts of catastrophic events.

Volunteers usually know their watershed history better than nonresidents and can reach locations for sampling more quickly after a significant event, such as a heavy rain or a chemical spill. Physical evidence of accidental spills may pass quickly without attention from agency officials. Sources of non-point pollution often are not obvious from maps or other resources available to off-site consultants. Watershed residents often have specialized knowledge of potential problem areas.

. . . provide appropriate information for decision making in a watershed.

The accuracy and utility of volunteer data for making decisions about land-use management has been proven in many established state programs. The National Weather Service was the first agency to successfully train volunteers to collect valid data. Recent studies in several states with established volunteer monitoring programs indicate that volunteers and agency biologists detected similar general patterns of water quality. Volunteer biases were fairly standard and could be improved with additional training. Volunteers tended to err by indicating greater pollution in clean streams and less pollution in stressed streams. The biases were corrected by emphasizing training in recognizing cryptic (small), rare, or indicator species. Most methods of measuring water quality using a scoring system account for natural variability over space and time and indirect influences of human land use. Therefore, carefully trained volunteers can provide information at the appropriate scale needed to make decisions regarding land use. Volunteer monitoring was most effective when used as an "early warning" system that is followed by agency biologists where needed. The single most important factor in effective monitoring is good record keeping.

The Importance of Test Parameters

The **habitat** of the stream determines many aspects of the stream or lake structure and affects some chemical characteristics. Vegetation along the bank filters nutrients and sediment in runoff. Trees and large shrubs at the waterline shade the stream, lowering the temperature and reducing algae growth. Tree roots, fallen logs and large boulders in shallow areas provide cover and nesting sites for fish and other animals. Many insects and sport fish species in Indiana streams require clean sand or gravel for and nesting sites. Species diversity is usually lower and exotic species, such as carp, often dominate where water is muddy and banks are eroding.

Physical characteristics of water include temperature, turbidity, and velocity. Like humans, plants

and animals are adapted to a particular range of temperature. In a hot environment, body processes speed up and organisms need more food and fluids, and use more energy to regulate body temperature, leaving less energy for other important activities like finding food or shelter. In a cold environment, body processes and behavioral activities slow down. Animals will move to a part of the water where temperature is more comfortable (e.g., shaded or deeper cold water in summer). Cold water has space for oxygen because molecules move more slowly. Warm water drives out oxygen. The toxic effects of some chemicals increase as water heats.

Sedimentation can cause a cascade of negative effects in water. Soil increases water temperature by absorbing heat. Poor water clarity interferes with feeding in predators that hunt by sight (including many sport fish), can cause hybridization if species that select mates by sight (e.g., sunfish), clogs gills during breathing and feeding, smothers nests and eggs, and fills crevices in gravel beds. Soil can carry attached toxic chemicals and phosphorus into the water. Erosion can carry dead plant and animal matter into water, which increases the fertilizing effect and burns oxygen through decomposition. Insects and other small organisms that thrive on breaking down plant matter increase at the expense of other organisms.

Velocity and discharge describe the amount and speed of water in the stream. Plants and taller algae forms rarely grow in fast-moving water due to damage from the force of the water. Only streamlined animals or animals with appendages for clinging to rocks or sticks live in fast-moving water. Energy spent in maintaining position in fast currents is not available for other important functions such as feeding or reproducing. In general, fast-moving or turbulent water contains more oxygen and is more well-mixed chemically, with an even temperature, than slower or ponded water that may have warm and cool spots, less oxygen, and areas with higher and lower pollution levels.

The **pH** of the water affects and responds to chemical reactions in the water. The pH measures relative amounts of acids and bases in water. The pH in Indiana waters generally averages from 7 to 9. When algae or plants consume carbon dioxide and produce oxygen, a chemical reaction causes the pH to increase up to 10. Decay of plant or animal matter also can cause the pH to decrease down to 6. Most Indiana waters are naturally hard with a large capacity to buffer changes in the pH. There are some waters affected by acidic mine drainage in which the pH is a potential problem for life in the water.

Oxygen is critical to sustain life for most organisms, including plants and animals. Plants produce oxygen during the day but consume oxygen at night or in cloudy conditions. Low oxygen can cause degradation or death by disrupting development or killing eggs and embryos; increasing toxicity of some chemicals; and reducing energy available to find food, fight disease, and reproduce. Animals that live or nest in shallow water are particularly susceptible to rapid changes in the amount of oxygen in water due to heating or decomposition.

Nutrients, or fertilizers, include any chemical that is required to increase the growth of plant or animal communities. Many of these chemicals are generally abundant enough to support populations. However, the key to managing plant or animal growth is to identify the nutrient that is required for growth and is in short supply (limiting factor). On land, most plant populations are largely limited by the availability of nitrogen. In water, most plant populations are limited by phosphorus. Additionally, sources of phosphorus are more easily controlled than sources of nitrogen. Plants or microscopic organisms that remove nitrogen from the air and convert it for use by other plants are often abundant. Phosphorus originally comes from rocks and is recycled in living systems by the process of consumption and decay.

Phosphorus is not directly toxic to plants or animals, but can kill fish or other oxygen-breathing animals through the indirect effect of increasing plant populations. Plants produce oxygen during the day and consume oxygen at night. An overabundance of plants causes so much oxygen in water that gas bubbles are

often seen on plant stems and leaves on sunny days (supersaturation). The large plant or algae population consumes an equally large amount of oxygen at night and can drive oxygen levels to nothing. This effect commonly causes fish or frog kills.

Nitrogen occurs in water in four different chemical forms: organic, or TKN; nitrate; nitrite; and ammonia. **Ammonia** is found in surface and waste waters but is usually low in groundwater because it attaches to soil. Ammonia can be toxic to fish, especially at high pH and high temperature. Ammonia decomposes into nitrate. **Nitrate** usually is low in surface waters but may be high in groundwater or tile drainage. Nitrate can cause sickness and death of unborn or infant humans and animals through an effect commonly known as "blue baby syndrome." Nitrate can interfere with the ability of iron to carry oxygen in blood, causing the young animal to chemically suffocate. The national standard for nitrate is set at 10mg/l to prevent this effect. Nitrite is highly toxic but usually is found in small amounts and rapidly converted into other forms. Nitrite can enter a water supply through industrial discharges. If nitrite is measured at all, the combination of nitrate and nitrite are generally measured together. Organic nitrogen represents a combination of most forms of nitrogen that are carbon-based molecules and byproducts of plant or animal decay, including proteins, urea, and numerous synthetic materials. Measurement of organic nitrogen is often called "TKN" or total kjeldahl nitrogen, after the technique used in the test.

There are many natural and human sources of nutrients in water. Human sewage can enter from treatment plants and septic systems. Livestock waste can enter from overflowing manure pits or runoff following land application on fields. Wild animals and pets are also a source of nutrients. Eroding soil can carry phosphorus and ammonia. Drain tiles carry nitrates dissolved in water. Decay of organic matter from leaves, grass clippings, wood, dead plants and animals, and landfills can contribute organic nitrogen and phosphorus. Chemical tests cannot distinguish the source of nutrients but can indicate the amount of nutrients relative to the location of known sources of nutrients.

Wastewater presents a threat of spreading water-borne diseases. Many **pathogenic (disease-causing) organisms** are small, difficult to sample and identify, and dangerous to maintain for testing in the laboratory. Coliforms and fecal streptococci are two groups of bacteria found in the waste of warm-blooded animals. As such, their presence is an indicator of wastewater (fecal) contamination and potential for the presence of other disease-causing organisms. Escherichia coli, or E. coli, is a single species of fecal coliforms that is only found in waste from humans and other warm-blooded animals. For drinking water, total coliforms are the standard test because their presence indicates contamination of a water supply by any outside source. For recreational waters, the US Environmental Protection Agency (EPA) recommends using E. coli as the best indicator of health risk in water. In the past, tests were done to compare the relative abundance of fecal coliforms and fecal streptococci to indicate whether the probable source of contamination was human or animal. This comparison is no longer considered reliable.

Several test kits are available for volunteer use based on similar methods of growing and distinguishing the bacteria. However, proper handling precautions are essential when testing, for coliforms can be dangerous in case pathogenic organisms are present in the water. Every method for testing coliforms has positive and negative attributes. Selection of the most appropriate method depends on turbidity of the water sample; high or low range bacterial density; ability to distinguish total coliforms, fecal coliforms, and E. coli colonies; and use of sterile techniques in diluting, filtering, transfering, and auger handling techniques. For this reason, many of the volunteer monitoring programs do not specify a method but suggest carefully following the directions in the selected test kit. A data report must include a description of the testing method and appropriate units for the results (e.g., colonies per 100 ml). When appropriate facilities are not available for the tests or more accurate tests are needed, professionals should conduct the sampling.

Designing a volunteer monitoring program

Selecting the characteristics to be monitored

The success of any project, including a business or watershed project, requires knowledge and the development of capital and infrastructure. Monitoring is like accounting. An audit of a business will include measurements of the amount of stock on hand, business transactions over time, the capability to produce the product, and interactions between employees and customers. An audit of a stream, lake or wetland system includes similar measurements.

Capital represents the products that are available for sale or use and indicates the short-term viability of the system. The forms of "biological capital" that are available for human use and to support natural productivity include species diversity, population size, population structure, and species interactions. Species diversity includes the number of species and different types of species. Population size is the number (abundance) of individuals. Population structure includes an appropriate mix of both sexes for reproduction and of young, reproducing, and older individuals. Species interactions include predator-prey (feeding) and territorial (defending) behavior. Many checklists for monitoring animals or plants in an ecosystem will include measurements of some or all of these aspects of existing organisms in the lake, stream or wetland.

Measuring the existing capital in a business or ecosystem will not provide information on the long-term success of the system without also measuring the infrastructure. Infrastructure in a business or ecosystem includes the support systems that are necessary to continue production. Aspects of "biological infrastructure" include climate, soils, topography, vegetation, shape and size of the water body, seasonal patterns of temperature and rainfall, and connections between land use and water quality. These aspects are often measured with habitat descriptions, which include surrounding land use and testing the chemical and physical characteristics of the water.

Determining an appropriate level of monitoring effort

In most cases, available funding and time will limit the amount and kind of data collected for a project. The project managers must select the most cost-effective aspects and locations that will provide the most information with the least amount of monitoring. Aspects to consider include the history of monitoring in the project area; the location of sampling sites; the timing of samplings relative to seasonal changes, yearly variation, and storm events; and the combination of characteristics to monitor.

The type of project will provide general direction for selecting an appropriate level of monitoring. Monitoring can be used for quickly scanning waters in an area to identify potential problems; periodically assessing changes in water quality; repeating tests to confirm a problem identified at a location; establishing reasonable water quality goals for a project compared to high quality sites in the region; and using a particular combination of tests to diagnose the probable sources of suspected water quality problems. These factors will indicate the timing, location, and tests that will be most effective for monitoring.

A thorough investigation into existing monitoring data in and around the project area will assist with guiding appropriate monitoring efforts. Where possible, sampling should be repeated at locations where existing information is available for determining trends over time. If sampling techniques are known from past research, the use of similar techniques will increase the comparability of the data. Common sources of information include copies of past reports and historical pictures in the public library; aerial photographs and

soil surveys in the County Soil and Water Conservation District (SWCD) office; aerial photographs dating back to the 1930s in the State Archives in Indianapolis; records of rare species in the Heritage Trust Database, Division of Nature Preserves, IDNR; fisheries reports at the office of the IDNR District Fisheries Biologist or nearest State Fish Hatchery; agency reports at IDNR or IDEM; web pages for agencies and universities; and personal accounts of people who have lived in the watershed. Phone calls to request materials or information are more productive if the reason for the information and exact type of information needed is clearly given.

Site selection for monitoring

The scale of a project indicates how large an area will be covered with the sampling. Individual landowners may wish to test water entering and leaving their properties to determine their contributions to water quality changes. County managers or lake associations may conduct similar samplings but at the scale of the incoming and outgoing water at the county or lake levels. A subwatershed managed for improving land use practices may be sampled and compared to a similar regional subwatershed with known high water quality or with similar starting water quality and no project to assess the effects of the land use project. Water quality could be tested upstream and downstream of a particular project site before and after livestock fencing, manure pit installation, bank stabilization or other site-specific projects.

Site selection depends on location relative to the source, accessibility, and funding. For convenient and permanent access, most sites are located just upstream of a bridge crossing or other access point. Permission for access from private property owners is essential. The sites must be readily identified using a permanent structure (e.g., a road crossing) and latitude/longitude if possible, so future samples can be repeated at exactly the same location. In most watershed projects, sample sites are selected starting with the outlet of the watershed and moving upstream to distinguish inputs of each subwatershed with interest to the project. Testing at mainstem sites below each tributary distinguishes subwatershed effects, if the primary interest is in the mainstem water quality. Sites just upstream of the mouth in each tributary (beyond any backwater effects from the mainstem flow) detect differences in the water quality in each tributary. How finely the watershed is subdivided depends on the project goals and available resources for monitoring.

Timing of monitoring

Decisions about the timing of monitoring are guided by the type and accuracy of information needed for the project. More samples spaced appropriately in time will always improve the accuracy of the information. However, the need for extremely accurate information may be less relevant to decisions regarding most land-use practices. For instance, whether the nitrate level is 15 mg/l or 20 mg/l is not as important as knowing that the water quality standard of 10 mg/l is exceeded most of the year while livestock and animals are using the water as a drinking source. In general, sampling in late summer or fall is most valuable to identify problems related to point-source pollution. At this time of year, water temperatures are high, which decreases oxygen and increases the toxicity of many chemicals, and water levels are low, which concentrates pollution instead of diluting it. Sampling in the spring or immediately after a heavy rainfall will be most useful for determining effects of nonpoint-source pollutants contained in runoff. Any time land use changes, sampling could be repeated over a period of months or years to determine subsequent effects on water quality.

Natural variation can complicate the question of whether human actions are causing a problem. In general, at least two years of sampling under the same conditions is needed to determine whether the stream just had a “bad year” because of unusual weather or other natural causes that reduced the size of the

population. Special note of extreme weather during the sampling year is valuable for distinguishing whether water quality changes are due to humans or nature. Physical, chemical, and biological aspects of streams or lakes also differ, depending on where the sample was collected. Notes regarding the surrounding conditions at the sample site, such as in a pool, under shade trees, or near the bank are also important. Comparisons with similar sites that have not been affected by human activities will adjust for some of the natural variability.

What parameters of water quality can be measured?

Tests are listed below in order from most to least common tests for monitoring:

Habitat	**Chemistry**	**Biology**
watershed land use	temperature	aquatic insects
riparian zone	pH	fish
stream bank	dissolved oxygen (DO)	plants/algae
stream channel	phosphate	plankton
physics of flow	Nitrate	Mussels
	turbidity	
	fecal coliform	

What equipment is used?

Equipment cost and complexity differ, depending on which aspects of aquatic ecology are being monitored. The equipment below is listed in order of cost and complexity.

- Data sheets for systematic recording of observations on all aspects.
- Use of photography to document habitat condition or plant and animal observations is strongly recommended.
- Habitat observations can include visual reconnaissance, measuring tapes for depth and width, a variety of flow meters, light meters and other apparatus to determine amount of shading or other physical aspects.
- Kick net, vials, trays, hand lens or microscope for collecting organisms.
- Keys for identifying aquatic insects and other organisms.
- Chemical testing kit or spectrophotometer—county health departments, wastewater treatment plants, or other water utilities may be willing to run some of the more complicated tests (e.g., turbidity, total dissolved solids, fecal coliform, pesticides)
- Computer for data entry and analysis and/or modem to access computerized information (optional).

Data sheets

The appropriate selection of sampling sites and aspects to be measured in combination with accurate and complete records of the results are more important than the use of specific data sheets. Be especially careful to record data with appropriate units of measurement (e.g., inches, meters, mg/l, gallons). Unless the unit of measure is recorded, the number and collecting effort is usually useless. Data sheets are available from several monitoring programs in Indiana. Most of the data sheets are based on similar testing methods, but are arranged slightly differently. To facilitate data entry, record the observations on the sheets that are specific to the program receiving the information. Data sheets are useful as checklists to ensure that all required data have been collected and recorded.

What will it cost?

The cost of monitoring varies, depending on the aspects that are measured and the degree of accuracy. Habitat assessments require less technical training and very little, if any, expensive equipment. Chemical testing can be relatively expensive or very expensive, depending on the accuracy level and types of tests. In general, tests for turbidity, nutrients, and associated physical factors are less costly than tests for pesticides, metals, or other industrial contaminants. Biological monitoring costs about from about the same to somewhat less than chemical testing. In general, testing for macroinvertebrates is less expensive than for fish or mussels, but selection of organism group also depends on the purpose of the monitoring project. Cost for volunteer monitoring test kits can range from $250 for titration-based tests to $2500 for automated meters. Funding for projects from many state and federal programs includes a portion set aside for monitoring.

Appendix A:

Internet Addresses for Watershed Information

Agency Websites, Federal

USDA Natural Resources Conservation Service	www.nrcs.gov
US Fish & Wildlife Service	www.fws.gov
USDA Farm Services Agency	www.fsa.gov
US Forest Service	www.fs.fed.us
US Geological Service	www.usgs.gov
US Geological Survey Water Data	www.usgs.gov/data.html
US Environmental Protection Agency	www.epa.gov
US Department of Transportation	www.dot.gov
US EPA Office of Water	www.epa.gov/OWOW/index.html
Federal Register	www.epa.gov/fedrgstr
Great Lakes Information Network	www.great_lakes.net

Agency Websites, Indiana

Access Indiana	www.state.in.us/index.html
Indiana Department of Environmental Management	www.state.in.us/idem
Indiana State Health Department	www.state.in.us/isdh
Office of Indiana State Chemist	www.isco.purdue.edu/
Indiana Department of Natural Resources	www.state.in.us/dnr
Indiana Academy of Science	www.statelib.in.us/www/IAS/IAS.html
Purdue University	www.purdue.edu

Best Management Practices

Leopold Center for Sustainable Agriculture	www.ag.iastate.edu/centers/leopold/Leopold.html
Green Design Initiative	www.ce.cmu.edu:800/GDI/
National Mined Land Reclamation Center	www.nrcce.wvu.edu/Programs/nmicorg.html
Center for Watershed Protection	www.pipeline.com/mrrunoff/
Nonpoint Training and Resource Center	www.state.me.us/dep/blwg/training/nps.htm
EPA Management Measures	www.epa.gov/OWOW/NPS/MMGI/Chapter4/ch4-2c.html

Education (source material for educating children and adults)

Environmental Education Organizations	eelink.umich.edu/EEorgs.html
NEMO (Nonpoint Source Education for Municipal Officials)	www.lib.uconn.edu/CANR/ces/nemo/
Classroom of the Future	www.cotf.edu/Home/html
Ecoweb	www.ecosys.drdr.virginia.edu/EcoWeb.html
Indiana WET NET	ingis.acn.purdue.edu:999/wetnet.html
Building Environmental Education Solutions (BEES)	www.beesinc.org
Earth Alert	www.discovery.com/news/earthalert/earthalert.html
Global Learning and Observations to Benefit the Environment (The Globe Program)	www.globe.gov/fsl/welcome.html
Educating Young People About Water	www.edu/erc/ywc/index.html
IDEM Volunteer Monitoring Program	www.state.in.us/idem/owm/assessbr/volunteerwqmp.html
IDNR Hoosier RIVERWATCH	www.dnr.state.in.us/soilcond/riverwat.htm
U.S EPA Office of Water - Concerned Citizens	www.epa.gov/OWyou.html
Learning To Be Water Wise Education Products	www.getwise.org
Indiana Wetland Education Sites	www/doe.state.in.us/swcd/wetland.html
EPA Student Center	www.epa.gov.students
Environmental Education Link On The Internet	www.wwlink.net

Funding Sources

A Guidebook of Financial Tools	www.epa.gov/efinpage/guidbk98/index.htm
GrantsWeb	www.srainternational.org/cws/sra/resource.htm
Great Lakes Grants (GLNPO)	www.epa.gov/glnpo/fund/98guid.html
"EPA Grant-Writing Tutorial" software Available FREE from EPA	www.epa.gov/reg5oopa/news98/98opa327.htm
National Agriculture Library list of funding sources	www.nal.usda.gov/waic/funding.html
Funding Sources (EPA)	www.epa.gov/owow/watershed/wacademy/fund/sources.html

Organizations and Watershed Groups

Envirolink	www.envirolink.org
Environmental Organization Directory	www.webdirectory.com
National Association of Soil & Water Conservation Districts	www.nacdnet.org
Soil & Water Conservation Society	www.swcs.org
Conservation Technology Information Center	www.ctic.purdue.edu
American Association of Agricultural Engineers	www.asae.org
American Water Resources Association	www.uwin.siu.edu/~awra
Izaak Walton League (Save Our Streams)	www.iwla.org
Terrene Institute	www.terrene.org/index.htm
The Nature Conservancy	www.tnc.org
Society for Range Management	cnrit.tamu.edu/srm/index.html
American Fisheries Society	www.esd.ornl.gov/AFS
American Rivers (a watchdog organization)	www.amrivers.org
American Whitewater Affilliation	www.rahul.net/fallside/awa.html
ORSANCO Ohio River Sanitary Commission	www.orsanco.org
EcoNet Home Page	www.igc.apc.org/igc/en.html

Listservs, Message Groups, and Bulletin Boards

Rivernet	email to rivernet@igc.apc.org or send a message to Majordomo@igc.org with the message "subscribe rivernet-info" and your name.
IN.watersheds	send a message to in.watersheds@mwnet.mw.nrcs.usda.gov with the message "subscribe in.watersheds" This list is for watershed coordinators in Indiana.
Biocriteria	send a message to listserver@unixmail.rtpnc.epa.gov with the message "subscribe biocriteria" and your name.

MapsThat Can Be Viewed or Downloaded

Census Bureau GIS Resources	www.census.gov/geo/www/gis_gateway.html
EMAP	earth1.epa.gov:80/emap/
Surf Your Watershed	www.epa.gov/surf
Guide to Popular USGS Geospatial Data Products	nsdi.usgs.gov/nsdi/pages/geninfo2.html
On-Line Interactive GIS Map Service	poca.osmre.gov/watershed.html

Water Quality & Other Information Sources

National Extension WQ Database	hermes.ecn.purdue.edu:8001/server/water/water.html
National Agriculture Library (WQ Info Center)	www.nal.usda.gov/wqic
CSREES	www.reeusda.gov/new/csrees.htm
USGS Water Quality Information	h2o.usgs.gov
Virtual Law Library for State Government	www.law.indiana.edu/law/v-lib/states.html
North Carolina State WQ Group	www.bae.ncsu.edu/bae/programs/extension/wqg/
Universities Water Info Net	www.c-wr.siu.edu
Agricultural Nonpoint Source Resources	www.soils.agri.umn.edu/research/mn-river/doc/edinfowb.html

Guidebooks & Decision Making Tools

Farm*A*Syst & Home*A*Syst	www.wisc.edu/farmasyst
STEWARD (Support Technology for Environmental, Water, and Agricultural Resource Decisions)	rcwpsun.cas.psu.edu/steward/steward.html
Stream Corridor Restoration Handbook	www.usda.gov/stream_restoration
Arizona Partnership Handbook	ag.arizona.edu/partners
Conservation Technology Information Center - Bridge Builder A Guide For Watershed Partnerships Facilitator's Handbook	ctic@ctic.purdue.edu
EPA - Top 10 Watershed Lessons Learned	www.epa.gov/owow/lessons
A Guide to Developing Local Watershed Action plans in Ohio	chagrin.epa.state.oh.us/watershed/guide.guide.htm

Appendix B:

Contacts—Agencies and Organizations

State Agencies

Indiana Department of Natural Resources (IDNR)

Structured in Divisions. Each Division has an area of authority or concern, and administers programs related to that concern.

Divisions	
Soil Conservation	(317) 233-3870
Law Enforcement	(317) 232-4010
Engineering	(317) 232-4150
Entomology & Plant Pathology	(317) 232-4120
Fish & Wildlife	(317) 232-4080
Forestry	(317) 232-4107
Historic Preservation	(317) 232-1646
Land Acquisition	(317) 232-4050
Nature Preserves	(317) 232-4052
Oil & Gas	(317) 232-4056
Outdoor Recreation	(317) 232-4070
Reclamation (Mining)	(317) 232-1547
State Parks and Reservoir Management	(317) 232-4124
Water	(317) 232-4160

Indiana Department of Environmental Management (IDEM)

Watershed Management Section	(317) 233-8803

Indiana Office of the State Chemist (IOSC) (765) 494-1492

Indiana Association of Soil & Water Conservation Districts (SWCDs) (317) 692-7519

Federal Agencies

Natural Resources Conservation Service (NRCS)		(317) 290-3200
Farm Service Agency		(317) 290-3030
Rural Development		(317) 290-3100
US Geological Survey		(317) 290-3333
US Forest Service - Bedford Office		(812) 275-5987
US Fish & Wildlife Service - Bloomington Office		(812) 334-4261
US Environmental Protection Agency - Chicago Office		(312) 886-0209
Army Corps of Engineers	Louisville Office	(502) 582-5607
	Detroit Office	(313) 226-6828

Stakeholder Organizations

Asherwood Environmental Science Center	(219) 563-8148
Audubon Society	(317) 767-4690
Friends of the White River	(317) 253-3725
Hoosier Environmental Council	(317) 685-8800
Indiana Association of Cities & Towns (IACT)	(317) 237-6200
Indiana Chapter American Fisheries Society	(317) 232-4094
Indiana Lake Management Society	(317) 887-5855
Indiana Pork Producers Association	(317) 872-7500
Indiana Sportsmen's Roundtable	(317) 773-2944
Indianapolis Flycasters	(317) 891-2836
Izaak Walton League - Indiana Division	(219) 637-0011
Michiana Area Council of Governments	(219) 287-1829
Pheasants Forever	(219) 357-4918

Quail Unlimited	(812) 536-2272
Save the Dunes Council	(219) 879-3937
Sierra Club	(317) 972-1903
The Nature Conservancy	(317) 923-7547
Water Watchers of Indiana	(219) 658-9108

Watershed partnerships and coordinators -

See **www.state.in.us/idem/owm/planbr/wsm** for List

Appendix C:

Acronyms Used in Discussing Watershed Issues in Indiana

Acronym	Agency/Institution	State/Federal/Private
319	Section 319 of the Clean Water Act (funding). Also grants associated with Sections 104 and 205j.	Federal, through IDEM
ATSDR	Agency for Toxic Substances & Disease Registry	Federal
BIA	Bureau of Indian Affairs	Federal
BLM	Bureau of Land Management	Federal
CEQ	Council on Environmental Quality	Federal
CRP	Conservation Reserve Program	Program of NRCS
CTIC	Conservation Technology Information Center	Private
CZARA	Coastal Zone Administration and Remediation Act	Federal
DC	District Conservationist (of NRCS)	Federal Employees
DI or DOI or USDI	U. S. Department of the Interior	Federal
EPA or USEPA	U. S. Environmental Protection Agency	Federal
EQIP	Environmental Quality Incentive Program	Program of NRCS
FSA	Farm Service Agency	Federal
GIS	Geographic Information System	Term
GPS	Global Positioning System	Term
HEC	Hoosier Environmental Council	Private
IACT	Indiana Association of Cities & Towns	Private
IASWCD	Indiana Association of Soil & Water Districts	State
IDEM	Indiana Department of Environmental Management	State
IDNR	Indiana Department of Natural Resources	State
IFB	Indiana Farm Bureau	Private
IGS	Indiana Geological Survey	State
IOSC	Indiana Office of the State Chemist	State
ISDH	Indiana State Department of Health	State
L&RE	Lake & River Enhancement	Program of IDNR

MACOG	Michigan Area Council of Governments	Public
MRBC	Maumee River Basin Commission	Quasi-public
NACD	National Association of Conservation Districts	Private
NOAA	National Oceanic and Atmospheric Agency	Federal
NPS	National Park Service	Federal
NPS	Nonpoint Source Pollution	Term
NRCS	Natural Resources Conservation Service	Federal
OCA or OCAg	Office of the Commissioner of Agriculture	State
ORSANCO	Ohio River Sanitary Commission	Quasi-federal
OSM	U. S. Office of Surface Mines	Federal
OWM	Office of Water Management at IDEM	State
RC&D	Rural Conservation & Development (Program of NRCS)	Federal/Private
RD	Rural Development	Federal
SJRBC	Saint Joseph River Basin Commission	Quasi-public
SPEA	School of Public & Environmental Affairs (IU)	State
SRF	State Revolving Fund	Loan program through IDEM. Monies are federal, passed through the state.
SWCD	Soil & Water Conservation Districts	State
TNC	The Nature Conservancy	Private
TVA	Tennessee Valley Authority	Federal/Private
USACE or ACE or COE	U. S. Army Corps of Engineers	Federal
USDA	U. S. Department of Agriculture	Federal
USF&WS	U. S. Fish & Wildlife Service	Federal
USFS	U. S. Forest Service	Federal
USGS	U. S. Geological Survey	Federal
WATER Committee	Watershed Agency Team for Enhancing Resources	Multi-agency group that acts as a forum for watershed issues.
WQ	Water Quality	Term
WRP	Wetland Reserve Program	Program of NRCS